

A Guide to MENTAL TESTING

For

Psychological Clinics, Schools, and
Industrial Psychologists

BY

RAYMOND B. CATTELL, M.A., B.Sc., PH.D.

*Director of the School Psychological Service and Clinic
City of Leicester Education Authority*

WITH A FOREWORD BY

WILLIAM MOODIE, M.D., F.R.C.P., D.P.M.

Medical Director, London Child Guidance Clinic

Being a Handbook of Tests of Intelligence,
Attainment, Special Aptitudes, Interest,
Attitude, Temperament, and Character.

UNIVERSITY OF LONDON PRESS, LTD.

10 & 11 WARWICK LANE, LONDON, E.C.4

1936

FIRST PRINTED

APRIL 1936

Printed in Great Britain for the UNIVERSITY OF LONDON PRESS, LTD ,
by HAZELL, WATSON AND VINEY, LTD , London and Aylesbury.

DEDICATED TO MY CO-WORKERS IN THE
PSYCHOLOGICAL CLINIC AND
THE EXPERIMENTAL SCHOOL.

CECILIA BAKER RICHARD DEWHIRST.
JESSEY LOWE WINIFRED MILLER.
DIANA MILLIS· MARJORIE RAILTON.
MARGARET WALTON JAMES WILLSON.

FOREWORD

For some time there has been a lull in the progress of mental testing as a practical procedure. After the first wave of enthusiasm in the so-called Intelligence Tests, and their indiscriminate and often unintelligent application, this was bound to happen. It became evident that the results of these tests were influenced by factors other than intelligence, which seemed to elude measurement even if they were taken into account at all.

The psychotherapist, faced with problems of behaviour dependent on forces much more instinctive than intellectual, found the estimation of mental endowment alone of only limited value, especially since variations in mental capacity were always complicated by disturbances of the personality.

This was also the lot of the educational psychologist. Attainments often showed a marked discrepancy with test rating. Something obviously remained unexplained.

So the problem was thrown back and forth from one to the other, without any definite solution being arrived at.

In this book we have a much-needed and remarkably successful attempt to end this state of affairs. Looking on his subject from a wide angle, Dr. Cattell has sifted all those methods which aim at estimating, so far as can be, the various activities of the mind, using the term in a broad sense. He has wisely selected for detailed description only those whose value has been proved, and which are suitable for practical application. He has been critical and selective, and necessarily so, and he has substantiated his work with ample references.

Here, for the first time, is collected under one cover,

reliable information on all aspects of the subject. This book fills a long-felt want, and all practical psychologists, whether in educational, child guidance, or medical fields, will welcome it.

WILLIAM MOODIE, M.D., F.R.C.P., D.P.M.,
Medical Director, London Child Guidance Clinic.

CONTENTS

	PAGE
FOREWORD BY DR. MOODIE, DIRECTOR OF THE LONDON CHILD GUIDANCE CLINIC	vii
INTRODUCTION	xiii

CHAPTER I

THE MEASUREMENT OF INTELLIGENCE	I
(1) Research Findings Concerning the Nature of Intelligence	1
(2) Technique of Measurement	2
(3) Test Material	4
(A) Paper Tests—Verbal and Non-verbal	4
(i) Test Material Available (Detailed)	6
(ii) Other Tests (not detailed)	16
(B) Performance Tests	17
(i) Test Material Available (Detailed)	29
(ii) Other Tests (not Detailed)	37
(a) Form Boards	37
(b) General	41

CHAPTER II

TESTING SPECIAL APTITUDES—MECHANICAL, MUSICAL, ARTISTIC, DEXTEROUS, ETC.	45
(1) Nature of Special Aptitudes	45
(2) Notes on Methods of Converting Raw Scores into Significant Units	48
(3) Tests of Aptitudes	51

CHAPTER III

	PAGE
ATTAINMENT TESTS. SCHOLASTIC AND GENERAL . . .	75
(1) The Purpose of Attainment Tests . . .	75
(2) Technique of Construction . . .	77
(3) Available Material	80
(A) English and Arithmetic	80
(B) Other Accomplishments and Skills . . .	105

CHAPTER IV

GAUGES OF INTEREST, ATTITUDE AND OBJECT LIBIDO INVESTMENT	117
(1) Importance of Interest Tests	117
(2) Types of Test Employed	119
(3) Test Material Available	121
(4) Measures of Attitude	146

CHAPTER V

TESTS OF TEMPERAMENT AND DISPOSITION	148
(1) Temperament	148
(a) Surgency-Desurgency Tests	149
(b) Tests for Cyclothyme-Schizothyme, and Allied Type Distinctions (Kretschmer, Rorschach, Jacensch)	165
(c) Downey Will-Temperament Test	170
(2) Disposition	173

CHAPTER VI

	PAGE
PROBES OF CHARACTER AND THE STRUCTURE OF EMOTIONAL ADJUSTMENT	190
(1) Note on the Present Position of the Psychology of Character	190
(2) General Integration and Stability of Character	191
A. Rating Scales	193
B. Direct Tests	195
(i) Miniature Situations	195
Tests Available	199
(ii) Psychoneurotic Inventories, etc.	202
Available Test Material	204
(c) Indirect Tests concerning Type of Character Integration	207
(i) Perseveration Tests	207
(ii) Spot-dotting Test of Obsessional Make-up	223
(3) Measures of Specific, Restricted Character Traits	225
(4) Probes of Complexes and Individual Patterns of Emotional Adjustment	227
(a) Rating Scales and Self-Inventories of Neurotic Characters	227
(i) Rating Scales	230
(ii) Personal Questionnaires	234
(b) Word Association and Free Association Methods	246
(i) Word Association	246
(ii) Free Association, Play Observation, and Other Psychoanalytic Tech- niques	256
(c) Physiological Approaches and Methods	258

CHAPTER VII

	PAGE
NOTES ON THE SELECTION OF TESTS, INTERPRETATION OF RESULTS, AND SYNTHESIS OF EVIDENCE .	267
(1) Grounds for Selection of Tests . . .	267
(2) Interpretation and Synthesis of Results .	278
(3) The Complete Case Study	289
APPENDIX : NOTES ON MATHEMATICAL FORMULÆ .	298
INDEX	309

INTRODUCTION

FOR some unaccountable reason the expression 'Mental Testing' has been understood by many teachers and even a few psychologists as if it were written 'Intelligence Testing.' Text-books and articles dealing only with intelligence tests, or at the most with cognitive material, still appear bearing the title "Mental Tests." Obviously 'mental' should refer to the mind in all its aspects, intellectual and emotional, and that is the sense it bears in the title of this book, which deals with tests and diagnostic methods in regard to intelligence, attainment, special aptitudes, interests, emotional structure, temperament, and character.

My aim has been to provide (1) A handbook which shall contain between its covers sufficient instructions, test materials and norms to aid the experimenter in assessing the principal aspects of personality so far made accessible to exact examination. Without a practical handbook of this kind the psychologist is reduced to the time-consuming inconvenience of having to consult many different reference books and of carrying with him portfolios of obstinately errant test material.

Naturally the exactness and reliability vary considerably between such fields as intelligence testing, where research has long provided a sound theoretical basis, and the latest essays at character analysis which tread closely on the heels of pioneer research and can only be tentatively interpreted. With this explanation perhaps no apology is necessary for presenting the relatively untried 'Projection Tests' in the character-temperament section. They have promise in a region where most tests are of low validity and their publication may at least stimulate further research.

(2) A guide to most other available tests of any value (and from which the above are a selection), with brief

comments on their origin, validity, and source of publication. In general, only one or two tests are given in each field. Where American and English Tests are of equal goodness, the latter are usually given, since American standardisations are in some fields inapt to testing purposes in this country; but always the test based on sounder research is given first consideration. Tests of doubtful value are generally given no more space than suffices to print their titles. Even so, a complete catalogue of every test described in journals or placed on the market has not been attempted. Such a complete list already exists in Dr. G. Hildreth's *A Bibliography of Mental Tests and Rating Scales* (Psychological Corporation, N.Y., 1933), where over four thousand titles are recorded.

At the present time psychology is greatly beset by growing pains, and one is not surprised to find that the rather numerous specialists concerned with psychological testing—who all too frequently lack research training or fundamental qualifications—are often wildly at sea in their conceptions of what they are testing. They are equally without guiding principles in assessing the validity and reliability of new tests submitted to them.

Hence, although this book is primarily intended to be a handy tool for the busy psychologist and a guide to the inquirer after new tests, it prefaces each set of tests with a condensed account of the present position of research in the field concerned. Since this must be very brief, it is necessarily more dogmatic in tone than one would ideally like it to be. There is also a section on the interpretation and synthesis of test findings. These statements of the general background should be of considerable help to teachers and psychometrists, whilst even the fully qualified psychologist will sometimes find it convenient to have at hand ready references to the research sources of his accepted techniques.

Two eccentricities require explanation. I have omitted detailed description of the Binet Scale and its revisions because, in spite of its continued use by medical officers and

others, I find no scientific evidence for its being as valid as most of the tests devised since Spearman's principles were discovered. Besides which, it has too few pass or fail items, does not include tests for higher mental ages, contains tests of low 'g' validity, is overloaded with life experience and scholastic skill, and is often vitiated by too close personal influence of examiner on examinee (and vice versa). Secondly, I have used everywhere 'Consistency Coefficient' instead of 'Reliability Coefficient.' To the layman, at least, 'reliability' conveys more than that the test correlates highly with itself, and I am inclined to think that even to many psychologists it is subtly misleading. Consistency, on the other hand, expresses exactly what the coefficient measures. Probably the best system would be to apply the term Consistency Coefficient to self-correlations obtained by the 'split-half' method or from two testings in quick succession, and to reserve the term Reliability Coefficient for correlations obtained from testings separated by long intervals of time. In that case the Consistency Coefficient would be the measure of the self-consistency of the test, whilst the Reliability Coefficient would indicate in addition the degree of variability (with time) of the quality assessed, i.e. its "functional fluctuation."

All being well, this handbook will be revised at intervals in response to the progress of research and the publication of new tests. I shall be greatly indebted to anyone bringing to my notice tests which he considers ought to be included or supplying new and more extensive norms for tests already described. Much arduous work has in the past been unnecessarily repeated, and research inquiries duplicated through the lack of some central co-ordinating body, but with the recent establishment of the British Committee on Human Mental Measurements, to which the writer has the privilege to belong, this confusion should give way to a progressive organisation of test material, norms, and standards which it is hoped will be reflected in future editions of this or similar books.

I am greatly indebted to Professor Burt for permission to reproduce certain items from his classical *Mental and Scholastic Tests*, to which some sections of the present book are an introduction.

R. B. CATTELL.

PSYCHOLOGICAL CLINIC,
LEICESTER, 1936.

CHAPTER I

THE MEASUREMENT OF INTELLIGENCE

1. Research Findings Concerning the Nature of Intelligence

It is the aim of the intelligence test to test natural inborn capacity as distinct from acquired abilities. Considerable controversy existed as to what was meant by intelligence, and the design of intelligence tests was consequently a matter of personal taste. Mainly through the researches of the Spearman¹ school it has now become evident that our abilities consist of one massive general ability, hereafter called 'g,' and a host of special aptitudes or 's's.' A person's ability in any situation depends partly upon his amount of 'g' and partly upon his endowment in the 's' or 's's' that operate in that specific situation. In some performances - e.g. mathematics, classics, philosophy—'g' is far more important than the 's's'; in others—e.g. mechanical skills, singing, drawing—the 's' may weigh as heavily as, or more heavily than, the 'g' contribution.

The technique of the measurement of the more important 's's' is discussed in the next chapter. Here we shall deal with 'g.' 'g' may not be the same as 'intelligence'; their relationship depends upon the particular definition of the latter adopted. But in so far as there is a common meaning to the word intelligence, we may say that it corresponds closely to 'g.' Psychologists would prefer to designate these tests 'g tests,' but for purposes of ready comprehension by teachers and the general public, it is still usual to refer to them as 'Intelligence Tests.'

Since the 'g' hypothesis has been confirmed, the choice of 'intelligence tests' is no longer on an arbitrary basis.

¹ See Spearman's *Abilities of Man*. For a very condensed but comprehensive account of intelligence, see Rex Knight's *Intelligence and Intelligence Tests*, or F. C. Thomas's *Ability and Knowledge*.

A good sub-test in an intelligence test battery is one that correlates very highly with 'g' and has only a small specific 's.' The same technique enables one to decide to what extent 'g' is important in various school subjects and adult occupations, i.e. to predict from tests the fields in which a person may be successful and to what extent.

Measurements of 'g' show that it increases rapidly in early years, then more slowly towards 14, and remains constant after about 15 years of age. The exact age of cessation of growth is still a matter for inquiry, but there are indications¹ that the normal child's intelligence ceases to grow after 16 years, in the subnormal after 14 years, and in the supernormal after 18 years.

'g' is primarily expressed in terms of mental age. The child who scores as many points on a given test as, say, the average child of 11, is said to have a mental age of 11. His intelligence quotient (I.Q.) is obtained by dividing his mental age by his chronological age. To avoid fractions, the quotient is multiplied by 100. Thus a child with a mental age of 8 and an actual age of 10 would possess an I.Q. of 80:

$$\text{I.Q.} = \frac{8 \times 100}{10} = 80$$

This intelligence quotient remains remarkably constant for any given individual both during childhood and in adult life.² Differences of mental exercise and even of nutrition seem to affect it but little, though certain diseases may result in a reduction of I.Q.³

2. Technique of Measurement

Although one aims at measuring inborn capacity, there is no reason why it should not be accurately measured inferentially through the medium of some acquired ability, e.g. reading and verbal ability, provided all the persons to be measured have had equal training, i.e. have been equally

¹ "Occupational Norms of Intelligence and the Standardisation of an Adult Intelligence Test," by R. B. Cattell, *Brit. J. Psychol.*, xxv, 1, 1934

² "The Constancy of 'g,'" by C. S. Slocombe, *Brit. J. Psychol.*, xxvi, 17, 1926

³ *Physique and Intellect*, by Paterson, 1930.

exposed to opportunities for acquiring verbal skill. Indeed, experiment has shown that verbal tests are decidedly more 'saturated' with 'g' than are most non-verbal and performance tests. Stephenson¹ has shown, however, that there is probably a verbal factor over and above 'g' running pretty evenly through most verbal sub-tests, and that non-verbal tests are free from this. Nevertheless, having regard to the high saturation of the former with 'g' and to the fewness of satisfactory non-verbal sub-tests, it seems best to use a verbal test whenever a normal level of verbal education can be taken for granted, i.e. whenever one can be certain that the vocabulary demanded by the test is well within the vocabulary of even the most backward of the subjects.

In any other circumstances, as when a child has missed much schooling, or in testing foreigners not fully skilled in the language, or in all testing of young children below the age of 8, or especially with deaf and dumb children, a non-verbal or performance test is indicated.

Tests may be classified in various ways, and the division into verbal and performance tests or into group and individual tests is by no means exhaustive. There are verbal tests which require no reading or writing; there are verbal tests requiring only reading ability (no speaking or writing), and there are non-verbal tests which do not differ in any significant way from performance tests, except that they are done on paper and require movements of a pencil instead of movements of a wooden model. Again, even within the class of non-verbal paper tests, there is a very significant difference between 'pictorial' tests on the one hand and on the other 'perceptual' tests which deal only with lines and figures having no meaning or associations other than those directly given to perception. The latter could be used in inter-racial comparisons, even of civilised and uncivilised peoples, whereas the former, though suitable for peoples speaking different languages, could not be used where the pictures would be differently interpreted.

¹ *J Educ Psychol.*, March 1931

Everything considered, the most useful classification for the practitioner is into paper tests on the one hand and performance tests on the other. For the latter are almost exclusively individual tests, and their bulkiness frequently precludes their use outside the clinic or laboratory; whilst the former, whether verbal or non-verbal, can be used either as group tests or individual tests and are conveniently applied almost anywhere.

3. Test Material

(a) PAPER TESTS—VERBAL AND NON-VERBAL

There are at least four criteria by which a good intelligence test can be judged: (1) It should contain only subtests highly saturated with 'g.' These are such as Synonyms,¹ Classification, Instructions, Completion, Opposites, Analogies, Inferences, etc., and their various modifications, together with others yet to be devised and assayed. Some tests, e.g. Substitution, are good at low mental ages but not so g-saturated higher up. (2) It should be finely graded, i.e. have a large number (100-200) pass or fail items, which should be arranged in order of increasing difficulty. (3) It should be nicely adjusted in difficulty to the age of the subjects, and should not attempt to extend over too wide a range. (4) It should be adequately standardised on a truly representative sample of the population. That it should be intrinsically interesting goes without saying, though it is part of the psychologist's technique, in administration, to make every test entertaining.

Intelligence tests, like most Attainment tests, may be designed to permit either of 'selective' or 'inventive' answers. In the latter, the subject supplies the answer himself, whereas in the former he chooses the answer from a number of given alternatives. Although the selective system allows a certain number of correct responses to be obtained by sheer chance, it renders the test more objectively evaluated and eliminates the factor of mere ability to recall

¹ "Three Points of Interest to Mental Test Constructors," by C. S. Slocombe, *Brit. J. Psychol.*, xxviii, 19.

items stored in memory, a factor which is certainly quite distinct from intelligence. Most researches indicate that the selective form is more effective for the majority of uses,¹ and the principle is now followed in all good tests.

Granted that the strongest possible motives—competition, desire to please an adult, self-regard, curiosity—have been enlisted, and a sense of pleasurable anticipation aroused, the administration of most tests is a relatively straightforward proceeding. Nevertheless, the experience of most psychologists shows that many teachers have to be warned to resist the teacher's impulse to give help or instruction, and instead to follow the directions with unmitigated exactness. Not only is it necessary to get children uniformly interested, but also to give confidence to those who are nervous. In general, when one knows which is the duller and which the brighter section of the class, the former should be put at the front in order that one may watch lest they go widely astray, give them encouragement, and prevent copying—all of which errors of testing are more common in the duller sections.

Most tests have a time limit, which also should be exactly observed. The imposition of a time limit is in theory sound, since, granted the intention to work quickly, intelligent individuals are quicker² and consequently are penalised in a test without time limits by having to dally while the duller ones catch up. Nevertheless, temperamental slowness or quickness to some extent breaks through the intention to work quickly, and in any case nervous individuals may be flustered by the awareness that they will have to work at undue speed. Consequently the time limit has been adjusted in the author's tests to permit the average child just sufficient time to complete the test easily. With adults an exacting time limit is open to still greater objections.

In many instances one wishes to re-test a child's intelli-

¹ "An Enquiry into the Relative Values of the Inventive and Selective Forms of Group Tests of Mental Capacity," by J G Cannon, *Austral J Psychol*, 14, 25

² See *Quickness and Intelligence*, by E Bernstein, *Brit J Psychol. Monog Suppl* No 7.

gence after the lapse of some months or years. When more than a year elapses it is quite safe to use the same test, for the test items are almost invariably forgotten, and in any case the child's growing intelligence encounters the critical questions within a new region of the scale.

But for purposes of more immediate re-testing, the best-known tests are always prepared in an A and a B Form of equal difficulty and similar construction—the B Form being for re-testing shortly after the A Form has been used. The layman is frequently suspicious as to the effects of practice in intelligence testing. Since practice does not increase intelligence itself, the better the intelligence test—i.e. the more it is saturated with 'g'—the less is it susceptible to practice effects. Experiment shows that in repeated testings the score goes up very slightly between the first and second testings, but that thereafter the increase is quite negligible. This first increase through practice, as also, to some extent, that resulting from coaching, is nothing more than the settling down to that type of examination situation, and is only appreciable in the lower intelligence levels, or among very young children and with adults who have never been in an examination situation. In these cases—or still more where these cases are in a mixed group with practised individuals—it is wise to give a short 'practice' or 'buffer' test (the results of which are thrown away) before the test proper, when any accurate results are required.¹ For this reason the scores (but, of course, not the I.Q.) on the B Forms which are intended to be given last, are slightly higher than the equivalent scores on the A Forms, at least over the lower ranges of intelligence.

(i) *Test Material Available (Detailed)*

There are at present some half-dozen group and individual tests in this country that satisfy the above demands. Particulars of the age ranges for which they are suitable and the time required are set out below. Since details of administration and norms are given in the respective hand-

¹ See e.g. C. S. Slocombe, "The Influence of Practice on Mental Tests," *Forum of Educ.*, xxvi, 3.

books issued with the tests, no further instructions in regard to the use of these tests need be given here (except in the case of the author's own tests, where new norms are set out more recent than those available in the handbook). The Binet-Simon scale or any of its modifications is not included among them for reasons given in the Foreword. Its component test items are frequently more tests of scholastic attainment and life experience than of 'g'¹ and the pass or fail items are far too few. The personal relationship that arises between tester and tested in the course of the testing, and which is sometimes claimed to give greater reliability to this type of individual test, is just as likely to introduce errors because of shyness and other temperamental defects in the child² and because the examiner is likely to be affected in doubtful cases by the appearance and bearing of the child.³ It is certainly true that the examiner gains evidence of temperament and character traits in administering the Binet intelligence scale which he would not gain with paper tests, but when definite temperament tests are available it is a mistake to vitiate the intelligence test by roughly blending the two. The retention of the Binet tests in a good deal of clinical work to-day is alike a great tribute to the early genius of Binet and to the conservatism, rather than the scientific conscience, of those now using the tests.

Under some education authorities there is a tendency for 'intelligence tests' to be devised *ad hoc* by teachers. It is these efforts that often bring intelligence tests into disrepute, for they are almost invariably of a pattern which

¹ See e.g. "Intelligence Tests for Children of 4 to 8 years," R. B. Cattell and H. Bristol, *Brit J Educ Psychol*, III, 1933

² See also the evidence in Chapter VII, p. 268

³ Too strong a motivation in intelligence testing—as in most cognitive performance—may be disadvantageous

A group test would seem to produce quite adequate attention and interest. Over a wide range of motivation strength there is practically no variation of score on intelligence tests. Maller and Zubin ("The Effect of Motivation upon Intelligence Test Scores," *J. Genet Psychol.*, xli, 1936) found that very strong motive led to (i) no increase of score, (ii) increase in number of items attempted, balanced by (iii) increase in number of errors. See also A. Wild, "The Effect of Conation upon Cognition," *Brit J Psychol.*

is at once perceived to be ridiculous by any trained psychologist. Many glaring examples have been brought to my notice of selection on the basis of such *ad hoc* tests which has resulted in the selection of any but the right children. Moreover, measurements of actual I.Q. are impossible on these tests, since they are not technically standardised, so that any knowledge of the actual status of the child—with regard to standards employed in mental defect, in school classification, in special classes, in secondary school scholarship requirements, and in vocational guidance—is absent.

The following is a list of available tests, in alphabetical order. In presenting the descriptions of available tests it is necessary to point out that, generally speaking, an intelligence test should not have less than an hour's duration (except with young children). Teachers are often inclined to use shorter and shorter tests, whilst still hoping to use the results as a basis for important decisions—sometimes affecting the candidate's whole career. An hour is not too much to ask when such decisions are in question. The tests have been arranged according to age levels, i.e. according to the *mental ages* for which they are suitable and are provided with brief comments on their structure. Certain tests, notably the Northumberland, the National Institute, and the Cattell Tests, provide a complete series of uniform tests, one for each age-range section. With the exception of the Otis Test they are all English, since the wording and standardisation of American tests are often unsuitable for English children.

Infancy: 0-4-year Range

Gesell's Norms of Development from birth to the sixth year. Available in *The Mental Growth of the Pre-school Child* (Macmillan). No unusual apparatus needed. These test situations are by no means always tests of intelligence, but are probably fairly saturated with 'g' during the first and second year, especially those items in the "Adaptive Behaviour" section (chap. x). (No investigations on 'g'

value have been made.) They enable one to fix mental age to within about two months. Carefully selected and standardised, but the norms in the upper ages are a little low for English children.

BRIEF 'MENTAL CAPACITY' SCALE FROM GESELL (MAINLY 'ADAPTIVE BEHAVIOUR' ITEMS) FOR 0-4 YEAR RANGE

4 months	<div> <div>85 to 100%.</div> <div>65 to 85%</div> <div>20 to 50%.</div> </div> <div> <div>Can lift head when lying on back</div> <div>Resist pressure to move head.</div> <div>Follow slowly-moving plate or bright light with eyes</div> <div>Move arms in an attempt to shift piece of paper (letter size) placed over face when prone on back</div> </div>
6 months	<div> <div>85 to 100%.</div> <div>65 to 85%</div> <div>" " "</div> <div>20 to 50%</div> <div>0 to 20%</div> </div> <div> <div>Pick up spoon from table</div> <div>Sit up with slight support</div> <div>Express recognition of strangers as being different from familiar faces</div> <div>Look round for fallen spoon</div> <div>Sit up alone</div> </div>
9 months	<div> <div>85 to 100%</div> <div>65 to 84%</div> <div>" " "</div> <div>" " "</div> <div>20 to 50%</div> </div> <div> <div>Sit up alone</div> <div>React to mirror images (of self) shown Some response indicating interest or recognition counts as a pass</div> <div>Clasp and pull down ring dangled on string just above head</div> <div>Can say 'Mama' and 'Dada' and one other word</div> <div>Lift inverted cup to recover cube after seeing cube placed under cup</div> </div>
12 months	<div> <div>65 to 75%</div> <div>50 to 65%</div> <div>20 to 50%</div> <div>" " "</div> </div> <div> <div>Place cube in cup when told (without assistance by gesture).</div> <div>Climb (crawl) up stairs</div> <div>Walk alone</div> <div>Can pile <i>three</i> blocks (cubes) on top of each other to make a stable pile, after once seeing it done.</div> </div>
18 months	<div> <div>65 to 85%</div> <div>50 to 65%</div> <div>20 to 50%</div> <div>" " "</div> <div>" " "</div> </div> <div> <div>Make attempt to turn knob when wanting door open</div> <div>Make single vertical stroke (distinct from scribble) after seeing one made as a model</div> <div>Put cube in plate or in cup according to instructions (i.e. discriminate between plate and cup)</div> <div>Point to two parts of body (out of eye, nose, mouth).</div> <div>Pile <i>four</i> blocks in a stable pillar (see above).</div> </div>
2 years	<div> <div>65 to 85%</div> <div>" " "</div> <div>50 to 65%</div> <div>20 to 50%</div> <div>" " "</div> <div>" " "</div> </div> <div> <div>Pile <i>four</i> blocks in a stable pillar (see above).</div> <div>Make single vertical stroke, with pencil, in imitation (see above)</div> <div>Obey propositions</div> <div>Put the ball on the box</div> <div>Put the ball in the box</div> <div>Put the ball behind the box.</div> <div>Put the ball in front of the box (or chair).</div> <div>Put the ball under the chair (getting <i>three</i> correct)</div> <div>Make tolerable drawing of a circle after seeing one drawn</div> <div>Build 'bridge' with three bricks after seeing one made.</div> <div>Can name <i>three</i> objects in a picture (Dutch Home Scene) ("Tell me what you can see").</div> </div>

3 years	65 to 85%	Use pronouns, plurals, and past tense in speech
	" " "	Presented with several cubes and cup "Put just <i>one</i> block into the cup." Respond correctly
	50 to 65%	"Put <i>two</i> blocks in cup" (as above and after doing one successfully) Respond correctly
	20 to 50%	Copy a cross just recognisably from a model - presented (but not drawn in their presence)
	" " "	Can carry out three commissions without asking further. "Here's a key, I want you to put it on that chair over there, then I want you to shut that door, and then bring me the box which you see over there" (Pointing in turn to these objects) Repeat, stressing <i>First</i> put the key on the chair, <i>then</i> , etc.
4 years	65 to 85%	Successfully respond to instructions to put only two cubes in cup (See 3-year test above)
	" " "	Answer reasonably two out of three
	" " "	"What must you do when you are sleepy?"
	" " "	"What ought you to do when you are cold?"
	" " "	"What ought you to do when you are hungry?"
	20 to 50%	Copy a square (recognisably) from a model (but not drawn in their presence)
	" " "	Provide two oblong cards, one divided by a diagonal cut into two triangles. Child presented with two triangles and asked to "Put them together so that they look exactly like this (pointing to rectangle)" Allow three attempts of 1 minute each. Pass if two of three are successful.
4 years	" " "	Give an answer to "What must you do if you have lost something?" which shows that expression 'lost' is fully understood
	0 to 20%	Give a correct answer on three out of four 'missing feature' pictures. "What is left out of the face?" (Four pictures of faces as in Binet 7 year. One with mouth, one with nose, one with ear, and one with eye missing.)

The percentages on the left indicate the number of children found by Gesell to pass this test at the age concerned. A child should have the mental age indicated on the left when he passes the tests on which 50% (say 40-60%) of the children of that age succeed. But unfortunately Gesell's norms are not arranged in 50% categories. With the arrangement of items made above a child should pass for a given year when he succeeds in more than a half of the items for that year (except in the fourth year, when just a half will suffice).

Merrill Palmer Test for children of 21 to 63 months (effective range 2-6 years). Time required $\frac{3}{4}$ hour to $1\frac{1}{4}$ hours, according to child.—A medley of some 38 verbal and non-verbal tests, giving 93 separate diagnostic items. The test is not constructed on intelligence test principles in so far as the constituents are selected on grounds of *low* mutual correlation (see Stutsman, *Mental Measurement of the Pre-School Child*, 1922). Probably not a very sound measure of 'g,' but rather of general development. Interesting to children and highly practicable to administer. Correlates .78-.79 with Binet score. Recently standardised for this

country by Hilda Bristol (details published in Prof. Hamley's section¹ on "Mental Tests" in the *Education Year Book*, 1935), on 530 children, with the following results:

Age in Months	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	68
Points	11	17	23	30	34	44	51	57	63	69	73	76	79	82	84	86	87

The American norms, on 631 cases, are about 5 points lower than these over the whole range. Apparatus (fairly extensive) obtainable from Messrs. Stoelting, or from Raper, Psychological Laboratory, University College, Gower St., London.

Minnesota Pre-school Scale (Goodenough, Foster, Van Wagener). Range 18 months to 6 years.—Not so attractive to children as is the Merrill Palmer. Available, Educational Test Bureau, Minneapolis.

The California First-year Mental Scale.—A series of test items selected from various sources. Standardised on 61 infants over range 1 to 21 months. Consistency coefficient .62 (0-3 months) to .86 (4-18 years). Validity unestablished. Described in University of California Syllabus Series, 1933, No. 243.

On the whole, one is forced to admit that there are as yet no very satisfactory tests of 'g' over the 0-4-year age range.

Kindergarten Period: 4-8 years

Dartington Intelligence Scale (Cattell Intelligence Tests, Scale 0). Individual test, 4-8 years.—Eight validated subtests.² 96 pass or fail items. Standardisation slender, but on well-sampled group. Time required— $\frac{3}{4}$ hour; shortened form, 25 minutes. Obtainable from Messrs. G. Harrap & Co

Junior School Range: 8-11 years

Ballard's Junior Test (*New Examiner*, p. 236).—A mixture of test types, some of which involve a certain amount of general knowledge. 100 items. No time limit. Norms for elementary school children of 8-14 years.

¹ Or "The Testing of Intelligence," H R Hawley Evans Bros, 1935

² See "Intelligence Test, for Children of 4-8 years," by R B Cattell and H Bristol, *J Educ Psychol*, III, 1933

Cattell Test, Scale I. Non-verbal. Group or Individual. For ages 8-11 years.—Eight sub-tests of good validity. 106 pass or fail items. Standardised on 620 selected cases, including individuals of known mental age. Time required, 45-50 minutes. A and B Forms provided. The test can be given in a shortened form requiring 20 minutes. Stencil key. Preliminary practice given in test itself. Obtainable from Messrs. G. Harrap & Co. (This test replaces the verbal Scale I, the verbal test having been found not entirely satisfactory for children of 8-11.)

Otis Primary.—Eight non-verbal subjects of good validity. Ages 6-10 years. Norms too low for English children (about 11 points of I.Q.). English norms recently prepared. Results expressed in Indices of Brightness which are not comparable with Intelligence Quotients, and generally not so useful. Time required, about 35 minutes. Obtainable from Messrs. G. Harrap & Co.

Simplex Junior Group or Individual. An 'omnibus' type of test. Age range rather large (7-14 years) for accurate sorting of junior children. Time required, 45 minutes. Well standardised. Stencil keys. Obtainable from Messrs. G. Harrap & Co.

Sleight. Non-verbal. Ten short sub-tests of good validity. Age range 6-11 years. Time required, about 35 minutes (18½ minutes' testing time, remainder instructions, etc.). Soundly standardised. Obtainable from Messrs. G. Harrap & Co.

Senior School Range: 11-14 years inclusive

(Tests for scholarship examinations at 11 years should be chosen from the 11-14 mental age range, since most scholarship candidates between whom it is desired to distinguish finely fall at a 12-13 mental age.)

Cattell Test, Scale II. Verbal with non-verbal items. Group or Individual. Ages 11-15 years. (Quite suitable for average and sub-average adults.)—Six sub-tests of good validity, giving 151 pass or fail items. Standardised on 2,070 cases supplied from various parts of Great Britain. Time required, 70 minutes. The first sub-tests have a

generous time limit to give subjects a sense of confidence. A and B Forms provided. Preliminary 'practice' test supplied. The test can be given in a much shortened form requiring 24 minutes. Stencil key. Obtainable from Messrs. G. Harrap & Co.

Chelsea Tests. (P. B. Ballard.) Verbal. Ages 11-14 years. Group or Individual.—Four sub-tests giving 100 pass or fail items. First test timed, but others unlimited. Total time therefore varies, but about an hour generally suffices. Permits of inventive as well as selective answers. Tentative norms which do not cover low 11- and 12-year olds or high 13- and 14-year scores. Material and norms in *Group Tests of Intelligence* (Ballard).

Columbia Test. (P. B. Ballard.) Verbal. Ages 10-14.—Six sub-tests. Four or 5 minutes each; two untimed. Tentative norms not extending to mental ages below 10 or above 14. Material in *Group Tests of Intelligence* (Ballard).

Group Test 34. Verbal, with non-verbal items. Group or Individual. Age range 10-15 years—Nine sub-tests of good validity, giving 200 pass or fail items. Rather large vocabulary demand on two tests. Timed on each sub-test. Total test time, 38 minutes. Well standardised. Available from National Institute of Industrial Psychology.

Moray House Test 10. (Godfrey Thomson.) Verbal. Group or Individual. Ages 10.6-12.—Fifteen sub-tests representing five distinct types of sub-test. 100 items, some on only a two-response basis. Sub-tests not timed. Total time, 45 minutes, plus 10 minutes for a 'shock absorber test.' Very soundly standardised. Available from University of London Press.

Moray House Test IIa. (Godfrey Thomson.) Verbal. Group or Individual. Ages 10.6-12.—An 'omnibus' test, without distinct sub-tests, the instructions being given afresh on each item. Seventy-five items. Forty-five minutes, plus 10 minutes for 'shock absorber' test. Very soundly standardised, over small age range. Available from University of London Press. This test and test 12 were originally twin tests (i.e. A and B Forms), but the

latter has been converted into the Scottish Mental Survey Test.

Northox Group Intelligence Test. (G. P. Williams.) Ages 11-12 years.—Five sub-tests, one requiring arithmetical knowledge. Time, 30 minutes. Obtainable from Messrs. G. Harrap & Co.

Northumberland Mental Tests, No. 1. (Godfrey Thomson.) Group or Individual. Verbal. Ages 10-12·6 —Twelve sub-tests. Time required, 1 hour. Very soundly standardised on 2,500 children in Northumberland. Supplied with 10 minutes' practice 'introduction' test. Obtainable from Messrs. G. Harrap & Co.

Northumberland Standardised Tests—III, Intelligence. (Burt.) Group or Individual. Verbal. Ages 10-12, but quite effective a year above and below these limits.—Nine highly valid sub-tests. Time 10 minutes for preliminaries, 1 hour for test. Time limit on each sub-test. Soundly standardised. Obtainable from University of London Press.

Northumberland Mental Tests, No. 2. (Godfrey Thomson.) Group or Individual. Verbal. Ages 12·6 and over. Fourteen sub-tests, giving 60 pass or fail items. Time, 1 hour, notified every ¼ hour, but no limit on each sub-test. Soundly standardised. Obtainable from Messrs. G. Harrap & Co.

Otis Advanced Test. Verbal. Group or Individual. Ages 10 to about 13.—Ten sub-tests of good validity. Possibly not yet adequately standardised for English children. Results expressed as Indices of Brightness or as Intelligence Quotients. A and B Forms available; also an abbreviated test. Time required, about 1 hour 10 minutes. Obtainable from Messrs. G. Harrap & Co.

Scottish Research Council Mental Survey Test (1932). Verbal and Pictorial. Age range 10-12 years.—Mixed items. One demanding large vocabulary. Time required, 50 minutes. Very soundly standardised (on 87,000 Scottish children). Obtainable from University of London Press.

Simplex Group Test. Group or Individual. Verbal. Age

range 10-14 years.—Twenty-six sub-tests. (Rather big vocabulary demand.) Time required, 1 hour. Obtainable from Messrs. G. Harrap & Co.

Spearman's "Measure of Intelligence." Verbal. Booklets not required. Age range 10-14 years.—Seven highly valid sub-tests. Time required, about 1½ hours. Soundly standardised. (See *Forum of Education*, 1929.) Obtainable from Methuen & Co.

Adult Tests, i.e. 14 Years and Upwards

(*Note.*—Most of these tests are better adapted to 'superior adults.' For getting accurate measurements of the lower mental ranges among adults—e.g. among unskilled workers—it is advisable to use tests from 11-14-year ranges. In the case of adult defectives, the 4-8-range, e.g. the Dartington Scale, will be found most effective.)

Cattell Test, Scale III. Verbal with non-verbal items. Group or Individual.—Six highly valid sub-tests, giving 151 pass or fail items. Preliminary practice test. Time required, 1 hour 10 minutes. Time limit for each of sub-tests. Standardised on 2,000 adults, with additional occupational norms¹. A and B Forms available. The test can be given in a much shortened form (24 minutes), especially suitable for subjects of limited reading vocabulary. Stencil keys. Obtainable from Messrs. G. Harrap & Co.

Crichton Test. (Dr. Ballard.) Verbal. Group or Individual.—Omnibus test of 28 items. Inventive and selective answers. No time limit. Rough norms. Material in *Group Tests of Intelligence* (Ballard).

Group Test 33. Verbal. Group or Individual.—Five sub-tests. Synonyms require too large a vocabulary for average adult. Time required, 30 minutes. Obtainable from National Institute of Industrial Psychology.

Otis Self-administering Tests of Mental Ability. Higher Examination. Group and Individual.—One test of 75 items. Scored on 20 or on 30 minutes. A useful rough

¹ See "Occupational Norms of Intelligence and Standardisation of an Adult Intelligence Test," *Brit J Psychol*, xv, 1, July 1934

test of short duration. Obtainable from World Book Co., Yonkers, N.Y.

Measurement of Deterioration in Intelligence

A special case of the measurement of intelligence is that in which one is measuring the ability of some person in whom, through epilepsy or other psychotic conditions, or even through old age, deterioration is believed to have taken place temporarily or permanently. One wishes to measure both the present intelligence (which can be done in the ordinary way with a suitable 'g' test) and the original level of intelligence. The task of assessing the latter is like reconstructing the dimension of some ancient building from its present ruins. Size of vocabulary is known to correlate closely with intelligence among people of reasonably similar education. The researches of Simmins,¹ Babcock,² and others show that the vocabulary, at least in patches, persists at its original degree of elaborateness after intelligence has gravely declined. Score on a suitable vocabulary test, therefore, is the best means yet known to determine what ability a person once had.

The Terman Vocabulary Test, being standardised for adults, was used in the above researches, but other suitable tests will be found in the vocabulary section of "Attainment Tests," though they will need to be standardised afresh for this purpose—namely, in relation to I.Q.s among adults.

(ii) *Other Tests (Not Detailed)*

Measurement of Intelligence by Drawings (F. L. Goodenough). - - Owing to the very large specific factor in drawing ability, it is not a means by which one would normally choose to estimate intelligence. Scored in the particular manner worked out by Goodenough, however, correlations as high

¹ Constance Simmins, "Deterioration of 'g' in Psychotic Patients," *J. Mental Sci.*, October 1933

² E. Babcock, "An Experiment in the Measurement of Mental Deterioration," *Arch of Psychol.*, No. 117, N.Y., 1930.

as .76 with intelligence may be obtained. This is, therefore, a useful test for special circumstances, but the complexity of scoring does not recommend it for general use. For details, see *Special Aptitudes*, p. 54, of next chapter.

Bristol Group Reasoning Tests. (Dr. Barbara Dale.)—Inferences only. Well graded. A test which has been shown to involve a rather extensive special ability.¹ University of London Press.

Evesham Intelligence Test. (Dr. Haselhurst, Grammar School, Evesham.)

Leeds Intelligence Test. (Dr. Terry Thomas.)—Nos. 1-4 for boys of 11 plus. Further test for boys of 15-16. Bell & Co.

Oxton Group Intelligence Test. (G. P. Williams.)—For children of 11-14. Mainly general knowledge, as devised for certain Education Committees.

Porteus Maze Tests. Individual. Paper mazes, 6-15 years, one for each year

Tomlinson's "West Riding Tests of Mental Ability."—Highly valid sub-tests. Standardised. Hodder & Stoughton.

Wiltshire Intelligence Tests. (Not published for general use.) (Prof. Hamley and Dr. Philpott.)—A test based on recent research towards non-linguistic sub-tests. Institute of Education, London.

(b) PERFORMANCE TESTS

As already indicated, the term 'performance test' is used to cover a great variety of intelligence tests whose only common feature is that they require apparatus. Yet logically and psychologically they may sometimes present just the same situation as paper tests. For example, the Healy Picture Completion Tests, in which wooden pieces cut out of a picture pasted on a board have to be put back again, is not different from several tests classified with the paper tests above in which the subject indicates with a stroke of the pencil where necessary items from a picture should be replaced.

¹ See Spearman's *Abilities of Man*, p. 225, for summary of evidence

NORMS FOR CATTELL'S READY RECKONER FOR

SCORE ON COMPLETE TEST		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
SCORE ON ABBREVIATED FORM		8	10	11	12	14	15	16	17	18	19	20	21	22	23	25	26	27	28	
ACTUAL AGE OF CHILD IN YEARS AND MONTHS	4 0	84	90	94	97	100	103	106	110	113	117	120	123	127	131	135	139	143	148	
	6	75	80	83	86	89	92	95	98	101	104	107	110	113	116	120	123	126	131	
	5 0	67	72	74	77	80	83	86	89	91	94	96	99	102	105	108	111	114	118	
	6	61	65	68	70	73	75	78	80	82	85	88	90	93	95	98	101	104	107	
	6 0	56	60	63	65	67	69	71	73	75	78	80	82	85	87	90	92	95	98	
	6	51	55	57	59	61	63	65	68	70	72	74	76	78	80	83	86	88	91	
	7 0		51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	82	84	
	6					53	55	57	59	61	63	65	66	68	70	72	74	76	79	
	8 0					50	51	53	55	57	59	61	62	64	66	68	70	72	74	
	6								52	53	55	57	58	60	62	64	66	67	69	
	9 0										52	53	55	57	59	60	62	64	66	
	10 0													51	52	54	56	57	59	
	11 0															49	50	52	54	
	Adults 15 +															40	41	43	44	

Pick out the column which bears the score and the row marked by the age of

SCALE O (DARTINGTON SCALE)

CALCULATING INTELLIGENCE QUOTIENTS

48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90
29	30	32	33	34	36	37	38	40	41	43	44	46	47	49	51	52	54	55	56	57	59
152	157	161	164																		
135	140	144	148	153	158	164	169														
122	127	131	134	138	143	148	153	158	164												
111	115	118	121	125	128	134	139	144	150	155	161	167									
101	105	108	111	115	119	123	128	132	137	142	147	152	158	165							
93	97	100	103	106	110	114	118	122	126	131	136	141	146	152	158	164	170				
87	90	93	96	99	102	106	110	113	117	122	127	132	137	141	146	152	158	164	170		
81	84	87	89	92	96	99	102	105	109	114	118	122	127	132	137	142	147	153	159	165	171
76	79	81	84	86	89	93	96	99	103	107	111	115	119	124	128	133	138	144	149	155	160
72	74	76	79	81	83	87	90	93	97	100	104	108	112	116	120	125	130	135	140	145	150
68	70	72	75	77	79	82	85	88	91	95	99	103	107	110	114	119	123	127	132	137	142
61	63	65	67	69	71	74	76	79	82	85	88	91	95	99	103	106	110	115	119	123	128
56	57	59	61	63	65	67	69	72	75	77	80	83	86	90	93	97	100	104	108	112	116
46	47	49	51	53	54	55	56	57	58	59	62	64	66	69	71	73	75	77	79	81	84

the person tested At their junction will be found his intelligence quotient

NORMS FOR

DIRECTIONS — Pick out the column which bears the score and the row marked by the examinee expressed in

AGE IN YEARS	SCORE															
	FORM A	16	20	23	25	26	27	28	29	30	31	32	33	34	35	36
	FORM B	20	25	29	31	32	33	34	35	36	37	38	39	40	41	42
7 (6 9-7 2)	86	93	97	100	101	103	105	106	107	109	110	111	112	113	114	115
7½ (7 3-7 8)	80	87	91	94	95	96	97	99	100	102	103	104	105	106	106	108
8 (7 9-8 2)	75	81	85	88	89	90	91	93	94	95	96	97	98	99	100	101
8½ (8 3-8 8)	71	77	80	83	84	85	86	87	88	90	91	92	93	94	95	96
9 (8 9-9 2)	67	73	76	78	79	80	81	82	84	85	86	87	88	89	90	90
9½ (9 3-9 8)	63	68	71	75	75	76	77	78	79	80	81	82	83	84	84	85
10 (9 9-10 2)	60	65	68	70	71	72	73	74	75	76	77	78	79	80	80	81
10½ (10 3-10 8)	57	62	65	67	68	69	70	71	71	72	73	74	75	76	76	77
11 (10 9-11 2)	55	59	62	64	65	65	66	67	68	69	70	71	71	72	73	74
11½ (11 3-11 8)	52	56	59	61	62	63	64	65	65	66	67	68	68	69	70	71
12 (11 9-12 2)	50	54	57	58	59	60	61	62	63	64	64	65	65	66	67	68
12½ (12 3-12 8)	52	54	54	56	57	57	58	59	60	61	61	62	62	63	64	65
13 (12 9-13 2)	50	52	54	55	56	56	57	58	59	59	60	60	60	61	61	61
14 (13 9-14 2)			45	50	51	52	52	53	53	54	54	55	55	56	57	58
Adults (17 9-)																

AGE IN YEARS	SCORE															
	FORM A	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
	FORM B	61	62	62	63	64	65	66	67	67	68	69	70	71	72	73
7 (6 9-7 2)	141	142	143	144	145	147	149	152	154	157	159	161	163	165	167	170
7½ (7 3-7 8)	131	132	133	134	136	137	139	141	143	145	148	150	152	154	156	159
8 (7 9-8 2)	123	124	125	126	127	128	130	133	135	137	139	141	142	144	146	149
8½ (8 3-8 8)	116	117	118	119	120	121	123	125	127	128	130	132	134	136	138	140
9 (8 9-9 2)	109	110	111	112	113	114	116	118	119	121	123	125	126	127	129	131
9½ (9 3-9 8)	103	104	105	106	107	108	110	112	114	115	117	118	120	121	123	125
10 (9 9-10 2)	98	99	100	101	102	103	105	106	107	109	111	112	113	115	117	119
10½ (10 3-10 8)	93	94	95	96	97	98	100	101	103	105	106	107	108	109	111	113
11 (10 9-11 2)	89	90	91	92	93	95	96	97	99	100	101	102	103	105	107	110
11½ (11 3-11 8)	86	87	88	89	90	90	91	92	93	95	96	97	99	100	101	103
12 (11 9-12 2)	82	83	84	85	86	87	88	89	90	91	92	93	95	96	97	99
12½ (12 3-12 8)	78	79	80	81	81	82	83	85	86	87	89	90	91	92	93	95
13 (12 9-13 2)	75	76	77	78	78	79	80	81	82	83	85	86	87	88	90	91
14 (13 9-14 2)	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
Adults (17 9-)	67	68	69	70	70	71	72	73	74	75	76	77	78	79	80	81

This standardisation is based on measurements of some 1,200 persons as described elementary and secondary school scores, as described

SCALE I

age of the person tested. At their junction will be found the intelligence quotient of relation to a normal of 100

39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	FORM A
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	FORM B
117	119	120	122	123	125	126	128	129	131	132	133	135	136	137	139	7 (6 9-7 2)
109	110	112	113	115	116	117	119	120	122	123	124	126	127	128	129	7½ (7 3-7 8)
102	104	105	106	107	109	110	111	112	114	115	116	117	119	120	122	8 (7 9-8 2)
97	98	99	100	101	103	104	105	106	107	108	109	110	112	113	114	8½ (8 3-8 8)
91	92	93	94	95	96	98	99	100	101	102	103	104	105	106	108	9 (8 9-9 2)
87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	9½ (9 3-9 8)
82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	10 (9 9-10 2)
78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	10½ (10 3-10 8)
75	75	76	77	78	79	80	81	82	83	84	84	85	86	87	88	11 (10 9-11 2)
72	73	73	74	75	76	77	77	78	79	80	81	82	83	84	85	11½ (11 3-11 8)
69	69	70	71	72	72	73	74	75	76	77	77	78	79	80	81	12 (11 9-12 2)
66	66	67	68	69	70	70	71	72	73	74	74	75	76	77	78	12½ (12 3-12 8)
63	64	65	66	67	68	68	69	70	71	71	72	73	73	74	75	13 (12 9-13 2)
59	59	60	61	61	62	63	63	64	65	66	66	67	68	69	69	14 (13 9-14 2)
58	59	60	61	61	61	62	62	63	64	65	65	66	66	66	67	Adults (17 9-)

72	73	74	75	76	77	78	79	81	83	86	89	93	97	101	105	FORM A
76	77	78	79	80	81	82	84	85	87	90	93	97	100	104	108	FORM B
165	168															7 (6 9-7 2)
155	158	161	164	167		167										7½ (7 3-7 8)
145	148	151	154	158	162	167										8 (7 9-8 2)
137	140	143	146	149	153	158	168									8½ (8 3-8 8)
130	133	136	138	141	145	150	159	168								9 (8 9-9 2)
123	126	129	131	134	137	142	151	160	170	176	179					9½ (9 3-9 8)
117	120	123	125	128	131	135	144	152	162	167	170	181				10 (9 9-10 2)
112	115	117	119	122	125	129	137	145	155	160	163	173				10½ (10 3-10 8)
107	109	111	114	117	120	123	131	139	146	152	155	165	185			11 (10 9-11 2)
103	105	107	110	112	115	118	126	134	142	147	149	158	176			11½ (11 3-11 8)
99	100	102	105	107	110	113	121	128	136	141	143	152	170			12 (11 9-12 2)
95	97	99	100	104	106	109	116	123	131	136	138	146	163			12½ (12 3-12 8)
87	90	92	94	96	98	101	108	114	121	126	128	131	152	190		13 (12 9-13 2)
81	83	84	85	88	88	90	95	100	103	107	109	113	123	143	154	14 (13 9-14 2)
																Adults (17 9-)

elsewhere. The typical population is reconstructed from a combination of in the *Brit J Psychol*, January 1936

NORMS FOR

AGE IN YEARS	SCORE																			
	FORM A	39	41	44	47	52	55	58	61	64	67	69	71	73	74	75	76	77	78	79
	FORM B	40	42	45	48	53	57	60	63	65	69	71	73	75	76	77	78	79	80	
7½ (7 3-7 8)	93	100	106	113	120	123	127	130	134	137	140	141	147	149	151	153	156	158		
8½ (8 3-8 8)	83	88	94	100	106	109	112	115	118	122	124	126	129	131	134	136	138	139		
9½ (9 3-9 8)	73	79	84	89	95	97	100	103	105	108	110	113	116	118	119	121	123	125		
10½ (10 3-10 8)	67	72	76	81	86	88	90	93	95	98	100	102	105	106	108	110	111	113		
11 (10 9-11 2)	64	68	73	77	82	84	86	88	91	94	96	98	100	101	103	104	106	108		
11½ (11 3-11 8)	62	66	69	74	78	80	82	85	87	89	91	93	96	98	99	100	101	103		
12 (11 9-12 2)	58	63	67	72	75	77	79	82	84	86	87	89	91	92	94	96	98	99		
12½ (12 3-12 8)	56	60	64	68	72	74	76	78	80	82	84	86	88	89	91	92	93	95		
13 (12 9-13 2)	54	58	62	65	69	71	73	75	77	79	81	83	85	86	87	88	89	91		
13½ (13 3-13 8)	52	56	59	63	67	69	71	72	74	76	78	79	82	83	84	85	86	88		
14 (13 9-14 2)	50	54	57	61	64	66	68	70	72	74	75	77	79	80	81	82	83	85		
14½ (14 3-14 8)	50	54	57	60	63	64	66	67	69	71	72	74	76	77	78	79	80	82		
15 (14 9-15 2)	50	54	57	60	63	64	66	67	69	71	72	73	74	75	76	77	78	79		
15½ (15 3-15 8)	50	54	57	60	63	64	66	67	69	71	72	73	74	75	76	77	78	79		
16 (15 9-16 2)	50	54	57	60	63	64	66	67	69	71	72	73	74	75	76	77	78	79		
Adults (17 9-)	50	54	57	60	63	64	66	67	69	71	72	73	74	75	76	77	78	79		

AGE IN YEARS	FORM A	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113
	FORM B	98	99	100	101	101	102	103	104	105	106	107	108	109	110	111	112	113	114
7½ (7 3-7 8)																			
8½ (8 3-8 8)																			
9½ (9 3-9 8)	102	103	106	109	111	113	114	117	119	121	122	124	126	128	130	132	134	136	138
10½ (10 3-10 8)	117	118	120	123	125	127	129	131	133	135	137	139	141	143	145	147	149	151	153
11 (10 9-11 2)	140	141	143	145	147	149	150	152	153	155	156	157	159	160	162	164	166	168	170
11½ (11 3-11 8)	134	135	137	139	141	142	144	146	147	148	149	150	152	153	154	156	157	159	160
12 (11 9-12 2)	128	129	131	133	135	136	138	139	140	142	143	144	145	146	148	149	150	152	153
12½ (12 3-12 8)	123	124	126	128	130	131	132	134	135	136	137	138	140	141	143	144	146	147	149
13 (12 9-13 2)	118	119	121	123	125	126	127	129	130	131	132	133	135	136	137	139	140	142	144
13½ (13 3-13 8)	114	115	117	119	120	121	122	123	124	125	127	128	130	131	132	133	135	136	138
14 (13 9-14 2)	110	111	113	114	115	117	119	119	120	122	123	124	126	127	129	130	132	133	135
14½ (14 3-14 8)	106	107	109	110	112	113	114	115	116	117	118	119	121	122	123	124	126	127	129
15 (14 9-15 2)	102	103	105	107	108	109	110	111	113	114	115	116	117	118	119	120	121	122	124
15½ (15 3-15 8)	99	100	102	103	104	105	107	108	109	110	111	112	113	114	115	116	117	118	120
16 (15 9-16 2)	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	116
Adults (17 9-)	97	98	99	100	101	102	102	103	104	105	106	107	107	108	109	110	110	111	113

This standardisation is based on measurements of some 2,700 people, sampled from *Brit J Psychol*, January 1936. The principle of the 'shifting denominator' (as

SCALE II

79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	FORM A
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	FORM B
160	162	164	167	169	171	174											7½ (7 3-7 8)
141	143	145	147	149	151	153	155	157	159	161	163	165	168	171			8½ (8 3-8 8)
127	129	130	132	134	135	137	139	141	142	144	145	147	150	152	158	160	9½ (9 3-9 8)
114	116	117	119	121	122	124	125	127	128	130	131	133	136	138	143	145	10½ (10 3-10 8)
109	111	112	114	115	117	118	120	121	123	124	126	127	130	134	136	138	11 (10 9-11 2)
104	106	107	109	110	112	113	115	116	118	119	121	122	124	126	130	132	11½ (11 3-11 8)
100	102	103	104	105	106	108	109	111	112	113	115	117	119	121	125	127	12 (11 9-12 2)
96	98	99	100	101	103	104	105	107	108	109	111	112	114	116	120	122	12½ (12 3-12 8)
92	94	95	96	97	99	100	102	103	104	105	107	108	110	111	115	117	13 (12 9-13 2)
89	91	92	93	94	95	96	98	99	100	101	103	104	105	107	111	113	13½ (13 3-13 8)
86	88	88	89	90	92	93	94	95	96	97	99	100	102	104	107	109	14 (13 9-14 2)
83	84	85	86	87	89	90	91	92	93	94	96	97	99	100	103	105	14½ (14 3-14 8)
80	81	82	83	84	86	87	88	89	90	91	92	93	95	97	100	101	15 (14 9-15 2)
80	81	82	83	84	85	86	87	87	88	89	90	90	91	93	96	97	15½ (15 3-15 8)
80	81	82	83	84	85	86	87	87	88	89	90	90	91	93	95	96	16 (15 9-16 2)
80	81	82	83	84	85	86	87	87	88	89	90	90	91	93	95	96	Adults (17 9-)

114	115	116	117	118	119	121	124	127	130	133	136	139	142	145	147	148	FORM A
115	116	117	118	119	120	122	125	128	130	133	136	139	142	145	147	148	FORM B
																	7½ (7 3-7 8)
																	8½ (8 3-8 8)
																	9½ (9 3-9 8)
																	10½ (10 3-10 8)
																	11 (10 9-11 2)
																	11½ (11 3-11 8)
																	12 (11 9-12 2)
																	12½ (12 3-12 8)
																	13 (12 9-13 2)
																	13½ (13 3-13 8)
																	14 (13 9-14 2)
																	14½ (14 3-14 8)
																	15 (14 9-15 2)
																	15½ (15 3-15 8)
																	16 (15 9-16 2)
																	Adults (17 9-)

elementary and secondary school children in Great Britain, as described in the described for Scale III) has been employed on the upper reaches of intelligence.

NORMS FOR

AGE IN YEARS			SCORE																	
	FORM A		29	31	35	38	42	44	46	48	50	52	54	56	58	60	61	62	63	64
	FORM B		39	41	43	45	48	50	51	52	54	56	58	60	62	64	65	66	67	68
12½ (12 3-12 8)	58	64	68	72	80	88	92	96	100	104	108	112	116	118	120	121	128	132		
13 (12 9-13 2)	55	61	65	69	77	85	88	92	96	100	104	108	111	113	115	120	123	127		
13½ (13 3-13 8)	53	59	63	66	74	81	85	89	92	96	100	104	107	109	111	115	118	122		
14 (13 9-14 2)	50	57	60	64	72	78	82	85	89	93	96	100	103	105	107	110	114	118		
14½ (14 3-14 8)	50	57	60	64	70	75	79	82	86	89	93	96	100	102	103	107	111	114		
15 (14 9-15 2)	50	57	60	64	70	75	79	80	83	85	90	93	96	98	100	103	106	110		
15½ (15 3-15 8)	50	57	60	64	70	75	79	80	83	85	87	90	93	95	97	99	103	106		
16 (15 9-16 2)	50	57	60	64	70	75	79	80	83	85	87	90	93	95	97	99	101	103		
16½ (16 3-16 8)	50	57	60	64	70	75	79	80	83	85	87	90	93	95	97	99	101	103		
17 (16 9-17 2)	50	57	60	64	70	75	79	80	83	85	87	90	93	95	97	99	101	103		
17½ (17 3-17 8)	50	57	60	64	70	75	79	80	83	85	87	90	93	95	97	99	101	103		
18 (17 9-18 2)	50	57	60	64	70	75	79	80	83	85	87	90	93	95	97	99	101	103		
18½ (18 3-18 8)	50	57	60	64	70	75	79	80	83	85	87	90	93	95	97	99	101	103		
19 (18 9-19 2)	50	57	60	64	70	75	79	80	83	85	87	90	93	95	97	99	101	103		
19½ (19 3-19 8)	50	57	60	64	70	75	79	80	83	85	87	90	93	95	97	99	101	103		
20 (19 9-20 2)	50	57	60	64	70	75	79	80	83	85	87	90	93	95	97	99	101	103		

AGE IN YEARS			81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98
	FORM A		81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98
	FORM B		84	85	86	87	88	88	89	90	91	91	92	93	94	94	95	96	97	97
12½ (12 3-12 8)	178																			
13 (12 9-13 2)	171	173	175	177																
13½ (13 3-13 8)	164	166	168	170	172	174	177													
14 (13 9-14 2)	158	161	163	164	166	168	171	173	175	176	178									
14½ (14 3-14 8)	153	155	157	158	160	162	165	166	168	170	172	174	177							
15 (14 9-15 2)	148	151	152	153	155	157	160	161	163	163	166	168	171	173	174	175	176	177		
15½ (15 3-15 8)	143	145	146	148	150	152	154	156	158	160	162	164	165	167	168	169	170	172	177	
16 (15 9-16 2)	139	141	142	143	145	147	150	151	153	154	156	158	160	162	163	164	165	166		
16½ (16 3-16 8)	135	136	138	139	140	142	145	146	148	149	151	153	155	157	158	159	160	161		
17 (16 9-17 2)	131	133	134	135	136	137	141	142	144	145	146	149	151	153	154	155	156	157		
17½ (17 3-17 8)	127	128	129	130	131	132	136	138	140	141	142	144	145	148	149	150	151	152		
18 (17 9-18 2)	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144		
18½ (18 3-18 8)	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144		
19 (18 9-19 2)	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144		
19½ (19 3-19 8)	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144		
20 (19 9-20 2)	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144		

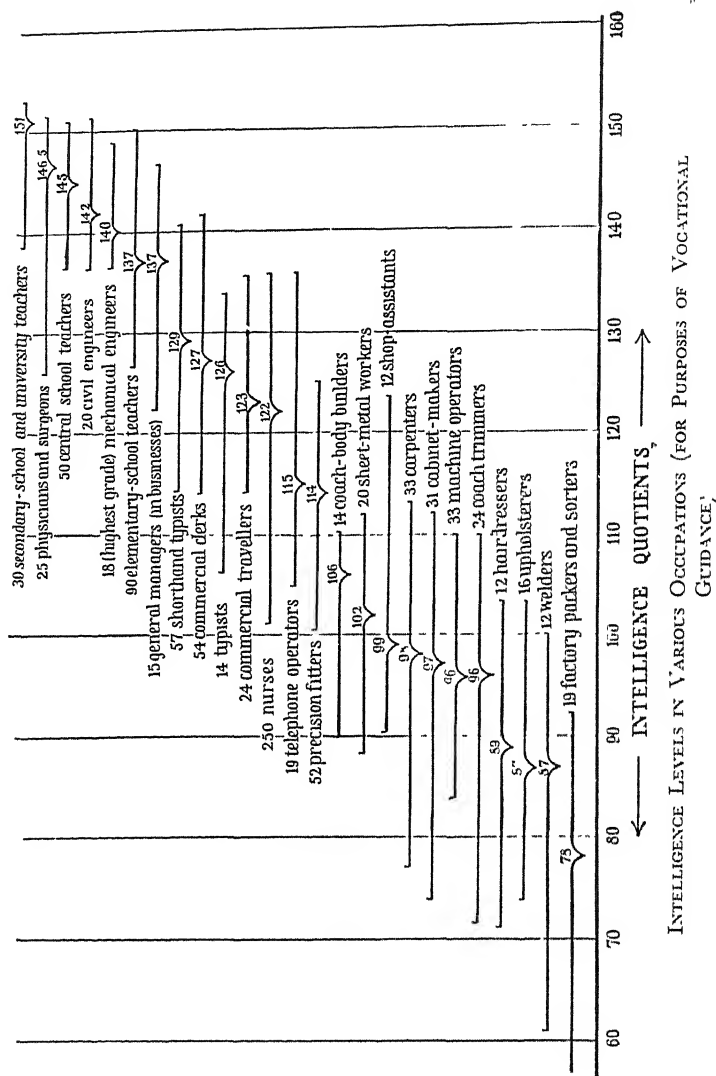
This table is based on norms from over 2,000 adults, sampled from a variety of occupations, and Standardisation of an Adult Intelligence Test," by R. B. Cattell (*Brit J Psychol*), developing a little longer with children of higher intelligence, so that there is a

SCALE III

65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80		FORM A
.69	70	71	72	73	74	75	76	77	78	78	79	80	81	82	83		FORM B
136	139	141	144	146	150	154	156	159	162	164	166	168	170	172	176		12½ (12 3-12 8)
130	133	136	138	141	143	146	149	153	155	157	159	161	164	166	170		13 (12 9-13 2)
126	128	130	133	135	139	140	144	148	149	151	153	155	157	160	163		13½ (13 3-13 8)
121	124	126	128	130	133	135	139	143	144	146	148	150	152	154	157		14 (13 9-14 2)
117	119	121	124	126	128	131	134	138	139	141	142	144	146	148	151		14½ (14 3-14 8)
113	115	117	120	122	124	126	129	132	134	136	138	140	142	144	146		15 (14 9-15 2)
109	111	113	115	117	120	122	125	128	130	132	133	135	137	139	141		15½ (15 3-15 8)
105	106	108	111	114	116	118	120	124	126	128	129	131	133	135	137		16 (15 9-16 2)
105	106	108	109	110	111	113	115	120	122	124	125	127	129	131	133		16½ (16 3-16 8)
105	106	108	109	110	111	113	115	117	119	120	121	122	123	125	129		17 (16 9-17 2)
105	106	108	109	110	111	113	115	117	119	120	121	122	123	125	126		17½ (17 3-17 8)
105	106	108	109	110	111	113	115	117	119	120	121	122	123	125	126		18 (17 9-18 2)
105	106	108	109	110	111	113	115	117	119	120	121	122	123	125	126		18½ (18 3-18 8)
105	106	108	109	110	111	113	115	117	119	120	121	122	123	125	126		19 (18 9-19 2)
105	106	108	109	110	111	113	115	117	119	120	121	122	123	125	126		19½ (19 3-19 8)
105	106	108	109	110	111	113	115	117	119	120	121	122	123	125	126		20 (19 9-20 2)

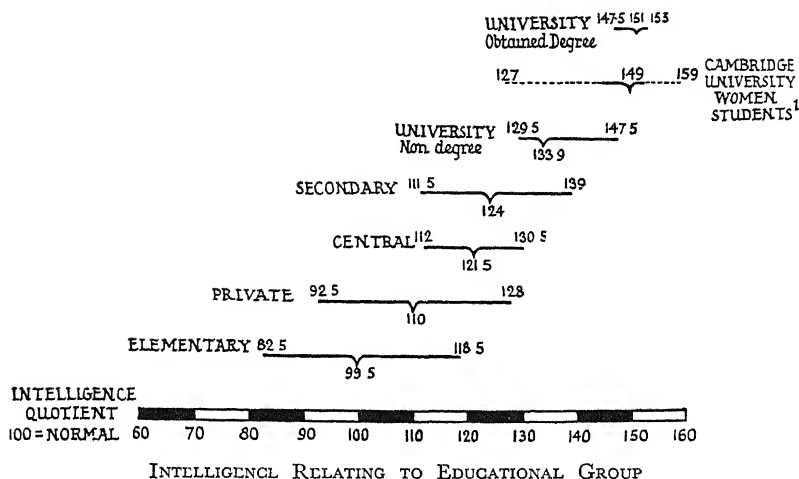
99	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	FORM A
98	99	100	102	105	106	108	110	112	113	115	117	118	120	122	125	127	FORM B
																	12½ (12 3-12 8)
																	13 (12 9-13 2)
																	13½ (13 3-13 8)
																	14 (13 9-14 2)
																	14½ (14 3-14 8)
																	15 (14 9-15 2)
																	15½ (15 3-15 8)
																	16 (15 9-16 2)
																	16½ (16 3-16 8)
																	17 (16 9-17 2)
																	17½ (17 3-17 8)
																	18 (17 9-18 2)
																	18½ (18 3-18 8)
																	19 (18 9-19 2)
																	19½ (19 3-19 8)
																	20 (19 9-20 2)

The manner of its derivation is explained in "Occupational Norms of Intelligence vol xxv, July 1934). It embodies the notion that intelligence goes on 'shifting denominator' to the I Q between 14 and 19 years of age



The central figure and ∇ on each line indicates the average I Q for the sample taken. The length of the line subtends the scatter of I Q for the middle 50 per cent in that occupation.

Abstracted from measurements on more than a thousand adults, as reported in "Occupational Norms of Intelligence and Standardisation of an Adult Intelligence Test," by R. B. Cattell (*Brit. J. Psychol.*, vol. xxv, July 1934).



Nevertheless, it is a proven fact¹ that, especially with young children, greater interest is spontaneously aroused by the performance type of test. Unfortunately the great majority of performance tests have quite low and even negligible correlations with intelligence. So great is the attraction of the performance test, however, alike to subject and examiner (for even the psychologist is not immune to the sense of increased prestige which important-looking apparatus gives him) that performance tests are widely used and depended upon, frequently in situations when, in fact, they are misleading and a waste of time.

The mass of performance tests are only now, for the first time, being subjected to any searching theoretical examination, and consequently the whole subject may be said to be in the melting-pot. From such a thorough research as that now being planned by The Scottish Council for Research in Education, we may expect more satisfactory tests to emerge in a few years' time.

¹ "Intelligence Tests of Children of 4-8 years," *Brit J Educ. Psychol*, 1. See also "The Use of Performance Tests of Intelligence in Vocational Guidance," *J. Inst. Indus Psych*, xxiv, 4.

Primarily performance tests are to be used for 'deaf people, foreigners, and illiterates—when the usual intelligence tests are naturally impossible—but even then a suitable non-verbal intelligence test is often preferable. The only homage that current practice pays to research findings is the convention that one shall not calculate intelligence quotients from performance tests—since the briefest experience shows that such intelligence quotients are anything but constant. The score is therefore always left as a mental age. In the case of those few performance tests that are highly valid tests of intelligence, no attention should be paid to this convention, and the usual I.Q. is best used.

Until the recent progress in temperament and character research has made itself felt in applied tests, there will still be good reason for using performance tests of even poor 'g' validity—because of the insight they give into temperament and character reactions in face of opportunities, difficulties, and frustrations.¹ The readiness of a child to get angry or to give up; the planfulness shown in moving the blocks in the Passalong test; the tendencies to excitability and impulsiveness in the Seguin Form Board; the confidence or hesitation in Knox's cube movements; the absence of self-criticism and foresight in maze tests, are revelations very helpful to the psychologist in getting at the root of a behaviour problem. Even the mental age itself, or rather its comparison with the mental age on a good (non-verbal) paper test, gives valuable evidence. A relatively high score on the Seguin board is definitely associated with, among other factors, high 'w,' i.e. general strength of character (see p. 197). In many performance tests, however, the discrepancies between true mental age and apparent mental age on the performance test are more often due to special aptitudes, mechanical aptitude, or manual dexterity.

There are, as has been indicated, innumerable perform-

¹ See e.g. "Interpretation of Reactions to the Pintner-Paterson Performance Scale," by E. M. Wires, *J. Educ. Res.*, 1931, xxiv, 53.

ance tests available (Healy, Bronner, Low, and Shimberg, for example, record 100), and many of them have been developed for limited purposes in vocational guidance, or nursery schools, or from some enthusiastic personnel manager's inner consciousness, without 'g' validation, without norms, and without research in regard to effective methods of scoring.

I shall therefore give full descriptions, norms, etc., only for a few tests of good validity which will provide the average psychologist with all he needs for most occasions. This section is followed by another merely listing, without detailed descriptions, most other important performance tests. The use of these can be read up in such books as Pintner and Paterson:

A Scale of Performance Tests;
or Healy, Bronner, Low,
and Shimberg: *A Manual
of Mental Tests and
Testing*.

(i) *Test Material Available
(Detailed).*

The *Seguin* (also called, when slightly modified, the *Goddard*) *Form Board* should be arranged to face the subject, as shown here. The pieces are placed in three heaps (not spread out) at the back of the board in the particular order indicated. The subject is told to replace the pieces as quickly as possible (using either or both hands).

He does this three times, and is timed with a stop-watch on each trial. The result can be scored either on time or on

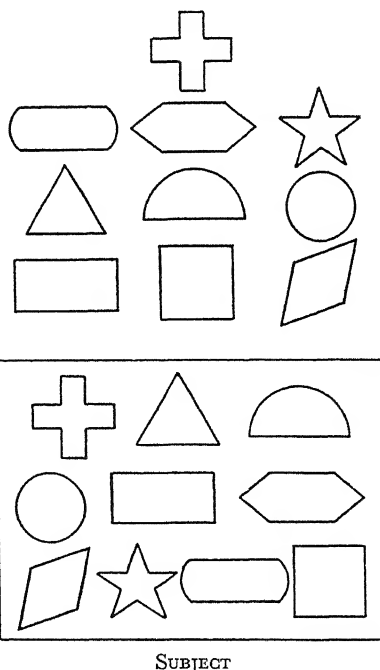


FIG. 1—Seguin Form Board Positions of Pieces in Three Heaps Ready for Re-insertion

time and errors. Since the judgment of errors is somewhat subjective, and since no better 'g' correlation results from including them, the time score alone is generally taken. This may be either the average of the three trials or the shortest of three. Probably the latter system is slightly better, since it relates itself to quickness of learning.

Norms.—There are two main sources of norms for this test: those obtained by Gaw and given in the *Industrial Fatigue Research Board Report*, No. 31, and those obtained on still bigger samples by Arthur¹ in America. The figures are practically identical over the 5–10-year range, but thereafter Earle's and Gaw's results give decidedly shorter times. This is of little importance, since the test is in any case not a good one in that upper range. The norms below are compounded of these two standards, and are further slightly modified in accordance with some additional results for which the writer is indebted to P. E. Vernon. Since this test is probably most diagnostic between 2½ years and 6 years, it is a pity that norms are lacking at this lower limit. The present writer has attempted to remedy this matter contingently by collecting scores from 3½ and 4½-year-old elementary nursery-class boys and girls, which have been averaged and included in the table below, producing a further modification (reduction) of times.

	NORMS									
Mental Age	3½	4	4½	5	5½	6	6½	7	7½	
Shortest of 3 trials (secs)	56	46	40	35	31	27	25	23	21½	
Total of 3 trials (secs)	216	161	133	123	114	105	98	90	83	
Mental Age	8	8½	9	9½	10	10½	11	11½	12	
Shortest of 3 trials (secs)	20	19	18½	17½	16½	16	15	14½	14	
Total of 3 trials (secs)	77	72	68	61	61	58	55	52	49	
Mental Age .	13	13½	14	14½	15	16	17	18	19	
Shortest of 3 trials (secs)	13	12½	12½	12	12	11½	11	10½	10½	
Total of 3 trials (secs) .	43	41	39	37	36	35	35	34	34	

The Seguin Form Board is a fairly valid 'g' test only below mental ages of about 10 (i.e. with children and adult

¹ *A Point Scale of Performance Tests*, by G. Arthur, N.Y.

feeble-minded). With greater capacities, in accordance with Spearman's "Law of Diminishing Returns," it becomes only a test of manual dexterity. Obtainable from Messrs. Stoelting, Chicago.

Ferguson Form Board.—A much more difficult Form Board suitable for older children and adults. A graduated series of six boards, the pieces in five of which are divided into two sections and otherwise complicated. Continue until subject fails on two consecutive boards. Present so that no two pieces belonging together are in juxtaposition. Time limit for each board, 5 minutes.

Score.—Record time on each board. Convert time into score according to table on p. 32, and then convert score to mental age according to second table.

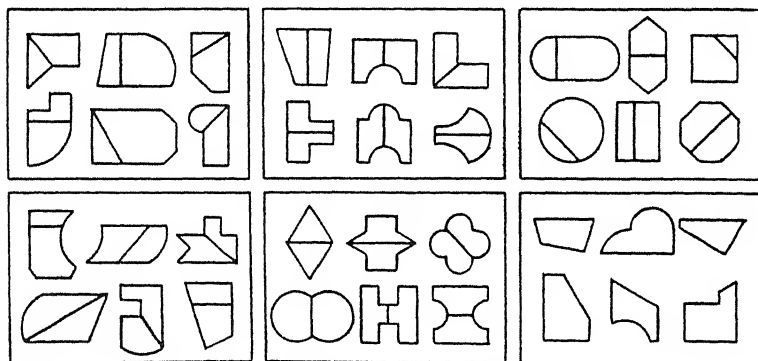


FIG. 2.—Ferguson Form Boards

For critical examination of its value see E. D. MacPhee and A. J. Brown: "An Enquiry into the Standardisation of the Ferguson Form Boards," *J. Educ. Psychol.*, xxx, 21. Found reliable, but increases of score not much related to mental age and low correlations with intelligence tests. Obtainable from Messrs. Stoelting

Leake-Smith Figure Board.—A more complex board with 12 holes and 3 or more coloured insets for each. These insets are also presented on a standard 'lay-out' board. Instructions as for other form boards except "All pieces go into holes the same colours as themselves." Quick test for

		FERGUSON FORM BOARD TABLE										
Values		10	9	8	7	6	5	4	3	2	1	0
Board I	Time in Seconds	0	17	20	22	25	28	30	37	52	67	F
		to 16	19	21	24	27	29	36	51	66	300	
Board II	,,	0	69	73	77	82	87	90	93	98	105	F
		to 68	72	76	81	86	89	92	97	104	300	
Board III.	,,	0	80	89	96	108	113	128	145	164	187	F
		to 79	88	95	102	112	127	144	163	186	300	
Board IV	,,	0	118	131	141	156	179	198	206	209	213	F
		to 117	130	140	155	178	197	205	208	212	300	
Board V	,,	0	168	182	198	217	233	243	254	265	272	F
		to 167	181	197	216	232	242	253	264	271	300	
Board VI	,,	0	224	249	263	268	270	273	278	286	295	F
		to 223	248	262	267	269	272	277	285	294	300	

NORMS VALUES INTO MENTAL AGES

Sex	Age	9	10	11	12	13	14	15	16
M		12	18	24	30	36	42	48	54
F.		12	18	24	30	36	34	38	41

colour blindness should precede test. Three minutes required. Score by number of holes completed. Details of board, together with rough norms, in *The Scientific Selection and Training of Workers in Industry and Commerce*, by M. Martin-Leake and Thyra Smith (Pitmans).

Knox Cube Imitation Test.—Material required: Five one-inch cube blocks of the same colour and material. Four are placed in a row in front of the subject, about two inches apart.

SUBJECT

4 3 2 1
EXAMINER

The examiner, holding the fifth cube in his hand, says, "Watch carefully, and then do as I do." He then taps the blocks with the fifth cube in a prescribed definite order (and at about one tap per second), always beginning with

the cube at the subject's left. He then lays the fifth cube down in front of the child between the third and fourth cube and says, "Do that." The following lines, in increasing complexity, are followed:

A. 1234	C. 1432	G. 13124
X. 12343	D. 1423	H. 143124
Y. 12342	E. 13243	I. 132413
B. 1324	F. 14324	J. 142341

(This order is Pintner's modification and extension of Knox's. X and Y follow on A as shown; thereafter one proceeds alphabetically.) The examiner proceeds until there are at least four successive failures, and gives one point for each line correct.

Mental Age	.	4	5	6	7	8	9	10	11	12	13	14	15	16
Score	.	1	2½*	4	5	5½*	6	6½*	6½*	7	7	7½*	8	8

Healy Picture Completion Tests. *Picture 1* (see Fig. 3a).—Place test before child with 48 pieces (10 correct and 38 alternatives) in irregular order at the back. Ask child to fill in pieces to make pictures look sensible and right (illustrate with 'wheel' block). Allow 10 minutes; most children finish in 5 or 6 minutes.

Scoring.—This is based on credit given to each piece as follows:

<i>Broken Windows</i>		<i>Cat</i>		<i>Hat</i>	
Broken windows	100	Cat	81	Hat	65
Closed windows	32	Barley	4	Barley	4
Blank	2	Chicken	2	Purse	3
Cage	1	Milk bottle	4	Mouse	2
		Flying bird	2	Cat	2
		Sleeping cat	2	Books	1
<i>Dog</i>		Cup	1	Flying bird	1
Dog	64	Fruit	1	Chicken	1
Barley	2	Standing bird	1	Dog	1
Blank	2	Stool	1		
Departing cat	2				
Broken windows	1				
Cat	2	<i>Football</i>		<i>Chicken.</i>	
Hatchet	1	Football	84	Chicken	58
Mouse	1	Baseball	21	Cat	2
Standing bird	1	Cherries	2	Cherries	2
Stool	1	Flying bird	1	Standing bird	2
		Pumpkin	1	Barley	1
				Cage	1

* There are, of course, actually no half-scores, but these are means—after Pintner and Paterson

There is apparently no increase after 16 years

	<i>Log.</i>		<i>Flying Bird</i>										
Log	.	52								Departing cat	1		
Hatchet	.	6	Flying bird	87						Flying bird	1		
Stool	.	2	Standing bird	18						Hatchet	1		
Blank	.	1	Cage	7						Mouse	1		
			Cherries	3									
			Basket	2									
	<i>Basket</i>												
Basket	.	55											
Cherries	.	7											
Bucket	.	2											
<i>Norms</i>													
Score	. 80	160	240	320	400	440	470	495	505	518	522		
Mental Age	5	6	7	8	9	10	11	12	13	14	15		

Picture 2 (see Fig. 3b).—Place board before child with 60 pieces in standardised places (given with apparatus). Say, "Picture begins here where the boy is getting dressed. A piece is missing from each picture. Pick out the one piece that makes the picture look more sensible and right and put it in the space. Begin here (examiner shows demonstration picture)." Study each carefully. Time limit, 20 minutes. A value is given for each piece as shown. Where *no* figure appears opposite in the following table, —5 is the value allowed.

HEALY PICTURE 2											
<i>Picture No.</i>	<i>Hole No</i>										
1	—	—	—	—	2	—	—	—	—	—	12 5
2	0	0	1	2	—	0	0	0	0	0	0
3	—	—	—	—	—	—	1	12 5	—	—	—
4	—	—	—	—	—	—	—	—	—	—	0
5	—	—	—	—	—	—	0	0	0	—	—
6	0	—	—	0	—	—	—	—	—	—	—
7	0	0	1	2	—	0	0	0	0	0	—
8	0	—	—	2	—	—	—	—	—	—	—
9	—	5	0	—	0	—	—	—	—	—	0
10	0	—	—	—	—	—	—	—	—	—	—
11	1	—	—	8	—	—	—	—	—	—	—
12	—	0	—	—	0	—	—	—	—	—	1
13	—	5	0	—	3	—	—	—	—	—	1
14	—	—	—	—	—	—	1	6	—	—	—
15	—	—	1	—	—	1	0	0	0	—	—
16	—	—	—	—	—	—	0	0	0	—	—
17	—	—	—	—	—	—	1	6	—	—	—
18	—	—	0	—	—	9 5	—	0	—	—	—
19	—	2	—	—	0	—	—	—	—	—	0
20	—	—	—	—	—	—	—	—	—	—	—
21	—	0	—	—	1	—	—	—	—	—	0
22	.	—	—	—	2	—	—	—	—	—	0
23	.	1	—	—	18	—	—	—	—	—	—
24	.	—	—	—	—	0	—	2	—	—	0
25	.	—	—	—	—	—	0	0	0	—	—
26	.	—	0	—	—	4	—	—	0	—	—

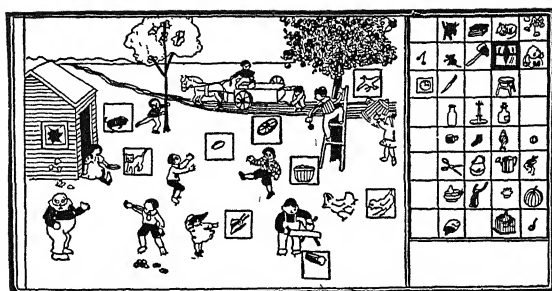


FIG 3 (a) HEALY PICTURE COMPLETION TESTS, PICTURE 1

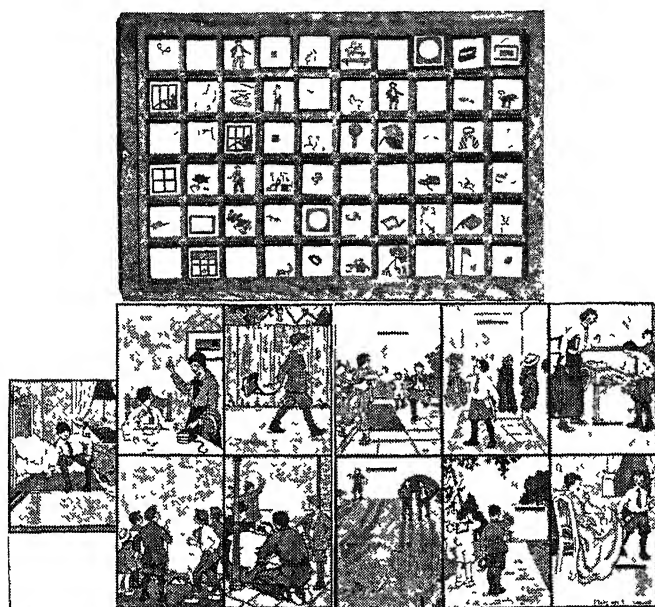


FIG 3 (b) HEALY PICTURE COMPLETION TESTS, PICTURE 2

HEALY PICTURE 2 (Continued)

Picture No	Hole No									
27	—	—	0	—	1	—	—	—	0	0
28	—	—	0	—	—	4	0	0	0	—
29	—	—	—	—	—	—	—	—	—	0
30	2	—	—	2	—	—	—	—	—	—
31	—	—	—	8	—	—	—	—	—	—
32	—	0	—	—	1	—	—	—	—	0
33	—	—	—	—	—	—	—	—	—	—
34	—	—	—	—	—	—	5	5	0	0
35	—	—	11	—	0	0	—	—	—	0
36	—	—	1	—	—	—	0	0	0	—
37	—	0	4	—	0	0	—	—	—	0
38	—	—	—	—	—	—	—	—	—	0
39	—	—	—	—	—	—	0	0	1	—
40	—	—	—	—	—	—	—	—	—	1
41	—	0	—	—	2	—	—	—	—	0
42	0	—	—	2	—	—	—	—	—	—
43	—	0	—	—	2	—	—	—	—	0
44	—	—	1	—	—	1	0	0	0	—
45	5	—	—	2	—	—	—	—	—	—
46	0	0	0	0	0	0	—	—	—	0
47	—	5	0	—	1	—	—	—	—	2
48	—	—	—	—	—	—	0	0	5	—
49	—	10	0	—	1	—	—	—	—	2
50	0	—	—	—	—	—	0	0	1	—
51	0	0	1	2	—	0	0	0	0	0
52	1	—	—	8	—	—	—	—	—	—
53	0	0	1	2	—	0	0	0	0	0
54	—	—	—	—	—	—	0	0	0	—
55	—	—	0	—	0	0	—	—	—	0
56	—	—	—	—	—	—	2	0	0	—
57	—	—	—	—	—	—	0	0	1	—
58	0	0	1	2	—	0	0	0	0	0
59	—	—	—	—	—	—	0	0	2	—
60	—	0	2	—	0	0	—	—	—	0

Norms from 1,542 cases (Healy, Bronner Low, and Shimberg):

Ages	7	8	9	10	11	12	13	14	15	16	17-20	20-50
75th percentile	24	41	48	59	63	66	69	72	76	75	76	78
Median	9	27	37	47	54	55	58	62	64	66	65	65
25th percentile	6	7	23	32	41	45	50	52	54	54	54	54

A recent enquiry by Stephenson shows this test to be quite low in 'g' saturation.

Passalong Test.—A performance test particularly suitable for the upper ranges of mental age (8-16) years. It consists of nine graded box problems, in each of which a given arrangement of red and blue blocks has to be converted (by sliding the pieces about) into another arrangement shown on a model (card). Scoring is straightforward, on suc-

cesses and times. Time required, 29 minutes maximum, but generally less, and seldom more than 15 minutes. Having regard to the time taken, this is one of the more valuable performance tests, for it involves no manual dexterity, is not obviously affected by general life experience, and correlates with intelligence tests to the extent of about $0.55 \pm .06$ (consistency 0.74). Soundly standardised.

Score Table for Reference¹:

Sub-Test or Box No	Time taken (seconds)												NORMS	
	0	31	61	91	121	151	181	211	241	271			Age	Score
	30	60	90	120	150	180	210	240	270	300			7 years 6 months	11
													8 years 6 months	13
													9 years 6 months	16
													10 years 6 months	19
													11 years 6 months	21
3, 4, 5, 6, 7	5	5	4	3	2	1							12 years 6 months	21
8	7	7	7	6	5	4	3	2					13 years 6 months	27
9	8	8	8	8	7	6	5	4	3				14 years 6 months	29
													15 years 6 months	32
													16 years 6 months	35
													17 years 6 months	37
													18 years 6 months	40
	Possible score			45										

Apparatus obtainable from the National Institute of Industrial Psychology, Aldwych.

Drever-Collins Performance Scale. Scale A.—A selection of eight performance tests, some of which are modifications of tests outlined below and some of which are newly devised by Drever and Collins. Consists of Koh's blocks design (modified), Knox's Cube (modified), Drever-Collins Domino. Size-weight test; Manikin, Feature Profile, 'Two Figure Board (modified), Healy and Fernald Completion Puzzle A (modified), Drever and Collins' Cube Test, Healy and Fernald, P.C. Test 1; Drever and Collins' 'Bo Peep' Test.

A supplementary test without language (3 from Series A and 3 new ones), entitled Series B, has been standardised for younger children (6 and under). Material obtainable from Baird, scientific instrument maker, Lothian Street,

¹ A second method of scoring, more finely graded for tuning and requiring fresh norms, is given in *Intelligence Concrete and Abstract*, p. 155, by W. P. Alexander (Camb. Univ. Press).

Edinburgh. Directions in *Performance Tests of Intelligence*, by Drever and Collins, published Oliver & Boyd, 1928.

A new Drever-Collins Performance Scale may be issued within the next two years, as a result of extensive research now being carried out on performance tests under the ægis of the Scottish Council for Research in Education.

Alexander Performance Test.—A scale of three tests; the Passalong, the Block Design (Koh's), and the Cube Construction, requiring about 45 minutes to administer. Alexander's monograph¹ shows this to be pretty good measure of 'g' and to measure in addition a group factor 'F'² (practical ability). The battery is a very promising one, and is well standardised (see p. 165 of Monograph).

Porteus Maze Tests. Vineland Revision (1919).—A series of thirteen mazes on paper, one for each year from 3-4 inclusive (except 13) and two for adults. A good test for observing impulsiveness, irresolution, planfulness. Boys tend to make slightly better scores than girls, so that temperament is probably being measured to some extent as well.

(ii) Other Tests (not Detailed)

A. Form Boards

Cornell Form Board.—Shapes as Seguin, but portions of holes can be changed about (Whipple's modification).

Dearborn Form Boards. (Dearborn and Anderson.)—Series of three: (1) triangle; (2) four irregular holes with pieces cut into smaller sections; (3) regular, with several insets to each hole, allowing four problems with different degrees of difficulty.

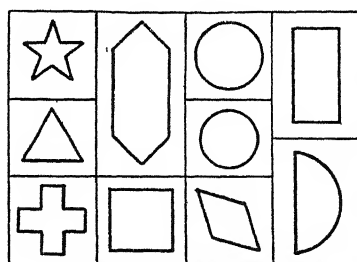


FIG 4

¹ A second method of scoring, more finely graded for timing and requiring fresh norms, is given in *Intelligence Concrete and Abstract*, p. 155, by W. P. Alexander (Camb Univ. Press).

² This should not be confused with 'f' for 'fluency of association' (see p. 151).

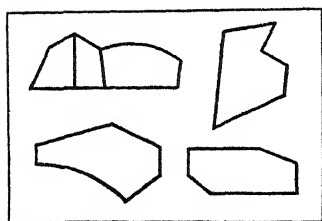


FIG 5

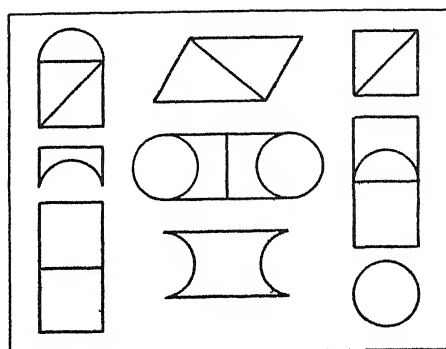


FIG. 6

Casuist Form Board. (Sprague and Knox. Pintner-Paterson modified.)—Suitable for older children and adults. Five sectionised pieces.

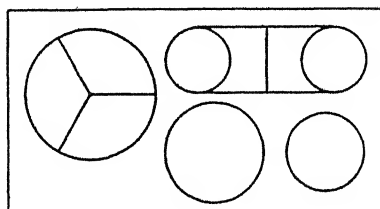


FIG 7

Two-figure Board. (Pintner-Paterson.)—For young children. Two pieces; one in five and the other in four sections. (Modification by Drever and Collins.)

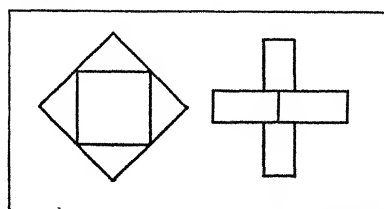


FIG 8

Gesell's Three-figure Board.—For infants.

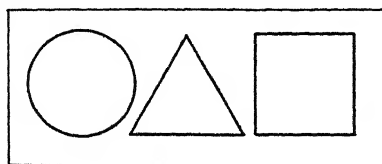


FIG. 9

Five-figure Board.—Five pieces each divided into two or three pieces; also arranged in one straight row of holes.

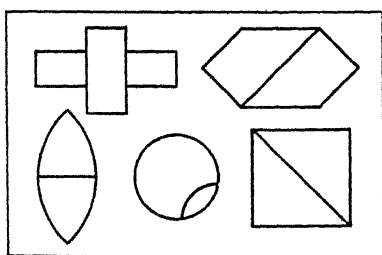


FIG. 10.

Triangle Test.—Gwyn's. Young children.

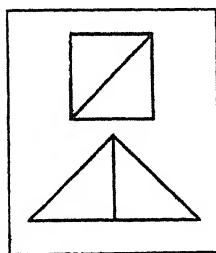


FIG. 11.

Diagonal Board.—Kempf's. Older children and adults.

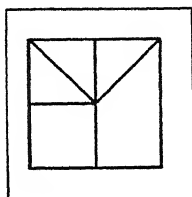


FIG. 12

Construction Puzzle A. (Healy and Fernald.)—Probably more 'g' saturated than most Form Board Tests. Older children and adult defectives. (Modified also by Drever and Collins.) Scored on time, number of moves, and repetition of impossible moves.

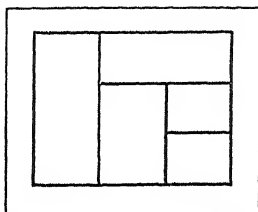


FIG 13

Construction Puzzle B. (Healy and Fernald.)—Adults.

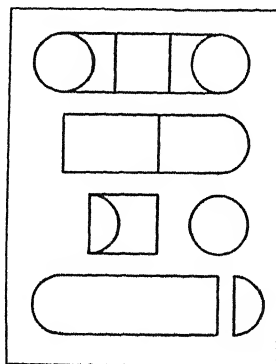


FIG 14.

Moorees Form Board.—A difficult form board suitable for adults and standardised for English subjects. Details with Dr. P. E. Vernon, Jordanhill Training College, Glasgow.

Oakley Form Board.—A complex form board involving colours and consequently revealing colour blindness if present. Suitable for older children and adults. No 'g' validation yet presented, but use over long period suggests this test may be more useful than most form boards in throwing light on temperament and character. Detailed description by C. A. Oakley, in *Human Factor*, March 1935. Obtainable from The Bar-Knight Model Co., 15 Margaret

Street, Glasgow, C.I. No thorough standardisation yet, but preliminary results on 102 cases show range of average times $3\frac{1}{2}$ to $4\frac{1}{2}$ minutes.

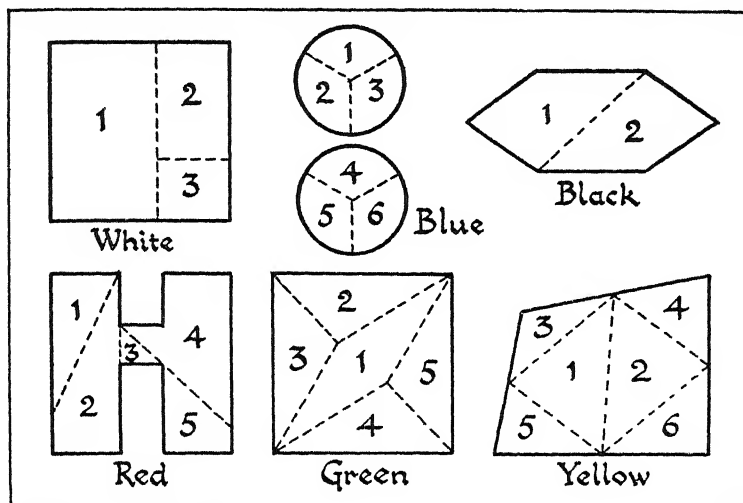


FIG 15—OAKLEY FORM BOARD

B. General Performance Tests

Arthur's Performance Tests.—A very widely standardised test, which also has the advantage of being available in two forms: (a) Form I, and (b) Form II for re-testing. On the other hand, relative to its length, it shows no advance in 'g' validity, since it includes some of the older and weaker tests. Suitable for mental ages from 6 years to 21 years.

Form I includes: (1) Knox Cube; (2) Seguin; (3) Two Figure; (4) Casuist; (5) Manikin and Feature Profile; (6) Mare and Foal; (7) Healy P.C. I; (8) Porteus Maze; (9) Koh's Block Design.

Form II includes: (1) Knox Cube (series reversed); (2) Seguin (board inverted); (3) Gwyn's Triangle Test; (4) Paterson's Five Figure; (5) Glueck's Ship; (6) Healy P.C. II; (7) Porteus Maze (number at left of subject); (8) Koh's Block Design (designs inverted). See present text for details of these. For particulars of standardisation as a

whole see "A Point Scale of Performance Tests," by G. Arthur, *Commonwealth Fund Publications, N.Y.*, vols. i and ii.

Binet-Simon Scale.—Burt's Translation. Individual Test. Age range, 3-16 years. An 'omnibus' type of test containing 65 pass or fail items for the whole age range, a few of them being subdivided into two or three items. Some items of high 'g' saturation; some very low. Verbal and non-verbal. Very soundly standardised. Material in *Mental and Scholastic Tests*, p. 24. This test is properly classified with the Performance Tests, both because of its nature and because of the fair amount of 'F' factor (practical ability) which Alexander's research (see p. 36) shows it to contain.

Modifications Available:

Burt Revision of the Binet Scale. Contingently standardised.

Stanford Revision and Extension. No adequate English standardisation. Ninety items, six for each year from 3 to 10, eight for 12, six for 14, 15, and 16.

Vineland Revision and Extension of the Binet Scale.

Yerkes' Point Scale Revision and Extension of the Binet Scale

Adaptation Board: Vineland.—A board with four holes and

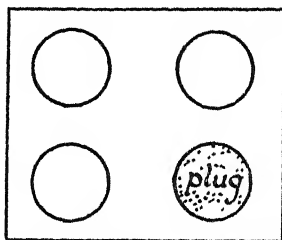


FIG. 16

a block which will fit only one of them. Subject has to follow this hole when the board is rotated in various ways. Probably a good test of 'g,' but not sufficient possible variation of score. Standardised. (Messrs. Stoelting.)

Wallin Peg Boards.—Four graded boards, similar to form

boards. Suitable only for nursery school infants or for low-grade imbeciles of any age. (Messrs Stoelting.)

Designs Test (part of the American Army Performance Test Scale).—Six designs shown to subject for 10 seconds each and then to be reproduced. Points according to completeness of reproduction.

Digit Symbol Test (American Army Performance Scale).—Extensive norms. Nine digits and symbols form a key, from which seventy-five digits have to be keyed. A substitution test similar to those included in many intelligence tests.

Koh's Blocks.—Imitation and construction of coloured models with coloured cubes. Well standardised. Whole range of childhood. Modifications in Drever-Collins Test and in Stutsman Sixteen-Cube Test. Correlates quite highly with 'g' (about .8), but not included in first line of tests (above), because takes rather much trouble and time to administer.

Mazes—Young's.—Slot maze (metal) 4-9 years. Standardised.

Cube-Construction Test.—Three-inch cube, painted in various parts to be reconstructed from parts. Three models. Correlation with 'g' of about 0.8. Well standardised.

Pyramid Test.—Stutsman. Imitating building block construction (for pre-school children).

Little Pink Tower.—Stutsman. Imitating building block construction (pre-school children).

Hollow Square.—Lincoln's. Eight separate problems, one minute limit to each. Children and adults.

Decroly Matching Game—Matching sixteen silhouette pictures on cards. Young children.

Atkins' 'Object-fitting' Test.—(Fitting familiar objects.) Consistency .79-.96. Instructions by Pantomime. 1½-5 years. Well standardised and pretty well 'g' saturated. 10-20 minutes required. Obtainable from Messrs. Stoelting.

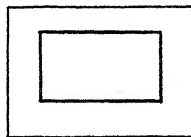


FIG 17—ELEVEN
PIECES PROVIDE
DIFFERENT WAYS
OF FILLING THE
HOLLOW SQUARE

Kent Shakow Complex.—For industrial purposes.

Kent Shakow Clinical.—Children and adults.

Worcester Form Board.—Four boards, but last two can be given in six different ways, i.e. eight boards are really available. Coloured suitable for adults and school-children and pre-school children.

Picture Completion Form Boards.—

Mare and Foal. (Healy and Fernald.) Very young children.

Manikin. Conventionalised figure of man, in six pieces. Suitable pre-school children.

Feature Profile Test. (Knox and Kempf.)—Older children.

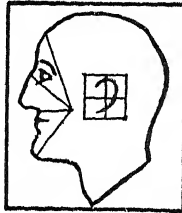


FIG 18

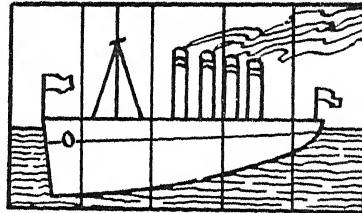


FIG 19

Ship. (Glueck.)—Children.

CHAPTER II

TESTING SPECIAL APTITUDES—MECHANICAL, MUSICAL, ARTISTIC, DEXTEROUS, ETC.

1. Nature of Special Aptitudes

OUR understanding of the special aptitudes—their limits, their measurement, and their natural history—is, so far, by no means in such a satisfactory state as that concerning intelligence. A good many tests devised for vocational guidance and purporting to make measurements of a person's gifts in special directions, e.g. manual dexterity, would not stand a moment's scientific psychological investigation. Even a well-planned test, such as Stenquist's Test of Mechanical Aptitude, proved on analysis to be testing manual dexterity as well as mechanical understanding, and to be strongly affected alike by practice and the extent to which a child's interests in mechanical things had had opportunity to develop.

Probably many aptitudes are not constitutional, like 'g,' but rather matters of acquired skill, which in turn may have been derived partly from the kind of temperament or character structure possessed by the individual during the formative years of his interests. (In such instances, it is an arbitrary matter whether the tests for aptitudes be placed in this chapter or in the next chapter on "Attainment Tests.") Thus, with our present deficiency of knowledge on the inborn and acquired factors in mathematical skill, it seems best to classify tests for it under "Attainment Tests," but later research may enable us to have tests both for the inborn aptitude and for the extent to which it has been clothed in trained knowledge.

Even though there is uncertainty as to whether the tests are tapping inborn aptitudes, it may still be of importance

to take measurements, for, in the circumstances of most lives, the mind does not remain indefinitely plastic, and the investments of time and interest that have been made by, say, the age of 20, are rarely completely obliterated. A group of persons obtaining poor scores on a mechanical aptitude test administered at that age is therefore unlikely ever to catch up to a group with higher scores. Certainly for selecting the best workers during the years directly succeeding the test, the employer does well to select according to the test results. Cox¹ has shown that even in manual skills, a type of ability highly susceptible to practice, the order of the candidates after a fairly long period of practice differs little from that obtained at a first testing, but this is probably true only under normal conditions of life, where there is no reason to suspect that some candidates have had opportunities for intensive practice.

To forget that special aptitudes may be susceptible to change through training and emotional readjustments is, however, not so dangerous an error—because not so common—as that of measuring special aptitudes where no special aptitudes exist. In the field of vocational guidance and industrial selection, as already mentioned, this *ad hoc* designing of tests supposedly measuring supposed special aptitudes has run riot. The most authoritative recent summary of the evidence² shows only some seven or eight proven special or group factors additional to 'g.' Among these are apparently (1) logical ability—methods of thinking involved in reasoning, weighing evidence, generalising; (2) mechanical aptitude ('m'); (3) arithmetical ability; (4) geometrical aptitude; (5) psychological aptitude—skill in recognising what to do in psychological situations; (6) musical ability; (7) verbal facility³ ('v') and practical ability ('F').

Of one of the special aptitudes most confidentially posited

¹ *Manual Skill, its Organisation and Development*, by J W Cox (Camb Univ Press, 1934)

² *The Abilities of Man*, by C Spearman, chap xiii

³ See W. Stephenson, "Tetrad Differences for Verbal Sub-tests relative to Non-verbal Sub-tests," *J. Educ Psychol*, 1931, xxii, and W P Alexander, *Intelligence, Concrete and Abstract* (Camb Univ. Press, 1935).

in various tests designed during the past twenty years—namely, “ability to think spatially”—research reveals no trace.¹ Among such tests as the various form boards, cube construction, maze tests, and jig-saw puzzles, no common spatial factor is found other than ‘g.’ That some people are particularly able in that direction must therefore be imputed to intelligence, and their relatively low ‘estimated’ intelligence to lack of ‘verbal factor.’ On the other hand, Alexander’s recent work indubitably shows that a factor of ‘practical ability’ (symbolised by ‘F’ and listed above) is common to three performance tests—the Passalong, the Block Design, and the Cube Construction—and that this factor is important in school subjects of a practical, handwork type. Possibly, since it has not been found in form boards, it is something akin rather to ‘planning capacity’ than to ‘spatial sense.’

Though so few special factors have yet been established, and though scepticism is the first necessity in contemplating the many so-called ‘tests of special aptitude,’ one or two tests, of an exceptional nature, have been included in the lists, even when no well-founded corresponding psychological factor is yet known. Later research may reveal such factors. In any case, they measure something specific over and above ‘g,’² and if the work in which success is to be predicted is practically identical with the activity of the test, the measurement is at least significant for that narrow purpose. Fortunately, research workers in many universities and at the National Institute of Industrial Psychology are now hot on the trail of these aptitudes, and we may expect shortly to know more about their nature and number.

When these aptitudes are known, however, it is most unlikely that their boundaries will conveniently coincide with those of the school ‘subjects’ or vocational classifications which civilisation arbitrarily marks out and labels. For example, we speak in schools of ‘Mathematical Aptitude,’

¹ See, however, the evidence on visual spatial sense ‘k,’ p 71

² A narrow specific factor is undoubtedly present, though a group factor may not be

but there appear to be two independent 's's' involved in 'Mathematics.'

Conversely, these factors may extend beyond what is thought of as mathematics, e.g. the 'problem mathematics' factor may be the same as the factor in 'logical reasoning.'

For the sake of clarity it will be most helpful to speak of 'abilities' when the emphasis is on the arbitrary categories of human activity (e.g. clerical 'ability') and of factors when we refer to the natural fundamental functional units in human mentality, e.g. mechanical aptitude factor, speed factor, which are revealed by statistical methods, e.g. tetrad analysis. Any 'ability' related to some job or confined to some academic subject is probably in most cases the resultant of 'g' and of two or three 'factors.'

2. Notes on Methods of Converting Raw Scores into Significant Units

Once more, as in intelligence testing, we are faced with the problem of converting the number of marks¹ scored on any particular test—the raw score—into terms which will be immediately intelligible in a wider sense and applicable to standards already established in the field of application with which we happen to be concerned, e.g. vocational guidance. With intelligence tests we used units of mental age, but now we are dealing with abilities that do not necessarily vary in any regular way with age. Moreover, many of the tests are most frequently needed for purposes of discriminating within the adult population.

Generally, the experimenter is faced with the problem of having to convert the individual's raw score into some figure which will signify at once that individual's position relative to others of the same age or class, or with regard to the population as a whole, and which can be added to or used with calculations of other scores obtained by the same individual. Three of the simplest methods of doing this, most widely used in applied psychology, are as follows:

¹ Some tests may not be scored in points even at the beginning. Such tests are based on the method of 'median samples' discussed in Chapter III, p. 78. But what follows here is equally applicable to tests first scored in those terms.

(1) One may work out the standard deviation (or the mean deviation) for the population concerned, and say how many units of standard deviation he is above or below the mean.¹ Thus, if the standard deviation should work out at, say, 4·5 points, a person having a raw score 9 points above the mean would have a final score of + 2 standard deviations; one having a raw score of 13·5 below the mean would have a score of - 3. Obviously this is a slightly cumbersome method of obtaining comparable scores, as it involves a good deal of calculation. Its advantage is, that with a normal distribution of cases, the frequency of occurrence of scores 1, 2, 3 and 4 times the standard deviation is a well-known figure (obtainable from tables) and this gives immediate significance to the results. Moreover, in many kinds of calculations, e.g. correlation coefficient calculations, the standard deviation is a value that is frequently involved.

(2) The equal units method is that employed in all the common grading of standards, etc., into A, B, and C types, and in the allotting of marks on a point scale. In all this work it is assumed that any one step is as good as any other. Among the raw scores themselves, on the other hand, arithmetically equal steps would not by any means represent steps of equal advance in the subject.

In this method we depend upon the fact that scores for most of the operations we measure arrange themselves in a normal symmetrical curve. If we take equal units along the base of such a curve, we find that the areas of the curve cut off by these units, i.e. the proportions of the population falling at each unit, follow the terms of a binomial expansion. This expansion must be chosen with regard to the number of points that one wishes to have in one's point scale. Thus, if I want to score a manual dexterity test on a scale of five units, each unit being theoretically equivalent to any other, then I build up a score distribution diagram (histogram) for, say, 2,000 people, and find the position of

¹ The standard deviation is obtained by subtracting each individual's score in turn from the mean score. These differences are then squared, the scores are summed up and the total thus obtained is divided by the number of cases, and the square root of the resulting figure is found. See p. 299

the vertical lines which will divide up its area into portions having the following ratios, reading from end to end 1, 4, 6, 4, 1. (The coefficients of the binomial expansion of $(1 + 1)^4$.) With this population of 2,000, the numbers would be 125, 500, 750, 500, 125. Perhaps the lines cutting these numbers will fall at scores of 78, 72.5, 69, and 64 marks. By such a method, 78 marks or over, therefore, has a score of 5 on this five-point scale; similarly, anyone between 69 and 72.5 would have a score of 3, and so on. If a ten-point scale had been needed, it would have been sufficient to divide the distribution according to the successive terms of the expansion $(1 + 1)^9$. The fact that equal steps on the raw scores do not in fact mean equal steps in value is obvious from this example, in which a difference in raw score of $5\frac{1}{2}$ marks (between 72.5 and 78) means at one part of the scale a difference of only one unit, whereas in another part (in the 69 to 72.5 region) it means more than two units.

(3) Percentile method, in which the score is given as the rank position among a hundred persons.

Each of the three methods—standard deviations, percentile ranks, equal unit intervals, has its advantages. The real issue to be faced in deciding which to adopt is whether the results from various tests may need to be added together afterwards to produce a summed resultant. If so, the percentile method is useless, because the interval between, say, 100 and 90 is really greater than that between, say, 40 and 50. For such purposes, as also for falling into line with the common classification (average, good, very good, poor, very poor) which tends to follow the normal distribution, the method of equal unit intervals is best. For results to be examined from the point of view of probable error, etc., the standard deviation method is best. For most other purposes the percentile method is easily first. Norms of the last-named kind can be very readily established, on populations of any size; they show the position of the subject at a glance, they contain the median and the quartiles within themselves; they are of especially good use in vocational guidance, where

one frequently has to proceed to selection knowing that a certain percentage of the population is admitted to a particular kind of employment, e.g. if 2 per cent. of the population can earn a living at music the person advised to take it up must fall roughly above the third percentile on musical aptitude tests. Most of the norms which follow in this section are given in percentiles.

3. Tests of Aptitudes

The various aptitudes to be discussed are arranged in alphabetical order. In each instance a brief résumé of present knowledge on the matter is followed by an account of the test material available.

ARTISTIC ABILITY

There have been no adequate investigations into the nature of this ability, into the relations of various branches of plastic art talent, into the connection of artistic appreciation with creative capacity, or into the emotional or hereditary roots of these abilities. It is only certain that some of the abilities (ability to draw and paint) are not closely correlated with intelligence,¹ and that a big special factor or factors must be involved.

Meier-Seashore Art Judgment Test.—Based on the reasonable assumption that æsthetic judgment, resting upon fine discrimination, feeling, and insight, is basic to success in art, whether it be sculpture, painting, etching, or some form of applied art. It consists of 125 pairs of drawings, the members of each pair differing from each other in some slight respect, which is, however, crucially important for composition, etc. (reproductions of the less well-known Old Masters, Japanese prints, etc.). Consistency Coefficient .71 to .85. Correlation with 'g' negligible. Validity roughly established by comparing score of talented children, of art students, and of persons of good intelligence, but no artistic capacity.² Time required, 45-50

¹ See e.g. H. F. Mannel, *Talent in Drawing*

² See H. A. Currall, "What do the Meier-Seashore and the McAdory Art Tests Measure?" *J. Educ. Res.*, 1932, p. 26, who found these two tests to correlate only $27 \pm .06$.

minutes. Norms from 1,850 high school (13 years and over) and art school students. *Material*: Picture book, manual, record sheets. From Bureau of Education Research, University of Iowa, U.S.A. The following approximate norms for English children have been obtained by the writer with 125 12- and 13-year-old elementary school children (a year or so of age difference does not appreciably affect the norms).

Deciles	10	9	8	7	6	5	4	3	2	1
	(highest)									
Score	Above 91	87-91	85-86	83-84	81-82	79-80	77-78	74-76	68-73	Below 68

Burt's Test in Æsthetics.—Nine pairs of photographs (Applied Art—jars, rugs, armchairs, etc.) for comparisons as in Meier-Seashore. These pictures were published in *The Listener*, and results are based on some 6,000 replies. Burt found the following mean scores (out of nine) for the following groups. A basis for more detailed norms on children of 7 to 18 years will be found in the *Brit J Educ. Psychol.*, iv, June 1934, in “Æsthetic Judgments of Children,” by M. H. Bulley.

	Men	Women
Artists	7.0	7.5
Art Teachers	8.1	7.9
Teachers (Science)	6.8	6.7
Army and Navy	5.8	-
Clerks .	5.8	6.3
Labourers and Servants	4.4	4.7

A useful ‘snap’ test, lasting only a few minutes, but necessarily rather unreliable on account of fewness of items.

The pictures were chosen by M. H. Bulley, and are taken from a fuller list of nineteen pairs published in “Have you Good Taste?” (1933). A similar excellently selected set of pictures, but in pure instead of applied art, will be found in M. H. Bulley’s *Art and Counterfeit*.

Cattell-Reynolds Test of Artistic Aptitude. (Small groups or individuals.)—A test with five distinct sections, separately assessable: (1) discrimination of colours and saturations (10 items); (2) memory for colour and shades (over short intervals) (10 items); (3) appreciation of composition (as

in Meier-Seashore); (4) sense of colour harmony, measured by 10 pairs of pictures identical in form, differing in colour combinations; (5) motor ability in drawing. An objective test of twenty items to test the subject's ability to draw what he has already conceived.¹ Time required, about 30 minutes. 60 items. Contingent standardisation. It is not claimed for this test any more than for others available in this field, that it is anything but tentative and based on *a priori* analysis of the capacities required in art. This test was devised with the help of the Leicester College of Art, and was divided into sections with regard to skill required in applied art in local industries.

Material : not yet made generally available, but will be published if further experiments prove the test satisfactory.

CLERICAL APTITUDE

Although in vocational guidance an estimate of aptitude for clerical work would be most valuable, nothing is known as to the nature of the abilities involved. A suitable temperament and a particular level of 'g' are obviously of first importance. So-called 'clerical aptitude' tests are partly measures of intelligence and partly examinations in attainment in the skills—sorting, indexing, recording, English, arithmetic—involved. The National Institute of Industrial Psychology's clerical test has been withdrawn as a test of clerical aptitude, but the following attainment tests exist:

Minnesota Vocational Test for Clerical Workers.—Details in *Personnel J.*, 1932.

Benge's Clerical Aptitude Test (Paper).—Obtainable from Messrs. Stoelting.

J.E.R. Clerical Test.—Institute of Educational Research, Columbia University, New York.

O'Rourke's Clerical Aptitude Test.—(1) Reasoning Problems. (2) Reasoning Test. Educational and Personal Publishing Co., Washington.

¹ Currall, *op cit*, found Meier-Seashore poor correlation with estimates of active artistic ability and McAdory test even poorer.

DRAWING ABILITY

It has long been established that ability to draw involves a big special factor in addition to intelligence; indeed, the former is far more important than the latter (Spearman¹ judges it approximately four times as important), so that borderline defectives may sometimes draw extremely well, and highly intelligent adults be unable to do so. Much indirect evidence suggests that this aptitude is largely inborn. In most children it develops very little after the age of 9 or 10.² There is some evidence that certain varieties of drawing skill are related to schizoid temperament and emotional instability.³

Tests Available

No extensive diagnostic standardised tests are yet available. For children the best test is:

Burt's Drawing of a Man described on p. 106 of the chapter on Attainment Tests. A valuable median samples scale.

Measurement of Intelligence by Drawing, by F. L. Goodenough. Chicago '26. This test, the standardisation and scoring of which is based on a detailed, part by part analysis, rather than on the 'whole' median samples method used by Burt, is intended as a test of intelligence⁴ through drawing and is consequently less suited than it might be for testing drawing ability *per se*. Nevertheless, it provides a good measure of capable and intelligent, if not of artistic, drawing performance. About 10 minutes, but no time limit. Child's drawing of a man. Chiefly for mental ages 4-10. Reliability .8 to .9; .75 with Stanford Binet. No arbitrary decision as to what does or does not constitute intellectual merit in drawing. Artistic standards disregarded and alleged to be not a test of artistic ability. Criterion of validity is correlation with actual and mental age (rather begging the question as to whether an intelli-

¹ C. Spearman, *Abilities of Man*

² F. Childs, *J. Educ. Psychol.*, 1915, vi.

³ C. J. Earle, "The Figure Drawings of Adult Defectives," *J. Mental Sci.*, April 1933

⁴ See Spearman, *Abilities of Man*.

gence test). Scoring requires careful study. Assessed on 50 points, e.g. fingers present, head shown, eye detail, free from clothing transparencies, etc.; girls score slightly higher than boys.

MIDLAND DRAWING SCALE FOR ADULTS

This is a brief scale of adult drawing ability, on the same lines as, and supplementing, Burt's scale for children.

The adult is given pencil and quarto-sized paper, and asked to draw a man, in the most effective manner he can conceive. He is given 10 minutes to do so. The following five-point scale of samples is based on drawings from 100 adults (men and women). It is based on the statistical device of the equal unit intervals, i.e. the general population distributes itself into these five grades in the ratios indicated by the following numbers:

Grade	I	II	III	IV	V
Number	1	4	6	4	1

The drawing to be assessed is compared with the samples in each of the five categories, and given the mark of the sample which it most nearly rivals. Note the tendency to bring in movement in the better samples.

DEXTERITY (MOTOR ABILITY)

The measurement of dexterity is of great importance in industry, because of the relatively large proportion of workers engaged in assembly, packing, machining operations, etc. With the increased attention now given in education to the developing of manual skills the diagnosis of ability in this direction promises to be of importance also in schools.

Although the measurement of dexterity might appear a simple matter, and although industrial workers have complacently 'measured' it in personnel selection for some time, there are many theoretical and practical difficulties.

Early work (e.g. that of Perrin,¹ Earle and Gaw²) seemed

¹ "An Experimental Study of Motor Ability," *J Exp Psychol.*, 1921

² "The Measurement of Manual Dexterities," Report No 4 National Institute of Industrial Psychology, 1930.

to show no group factor of 'dexterity'—it looked as if each particular skill must be measured separately by *ad hoc* tests. Garfiel¹ took into account, not only manual dexterity, but also dexterity of the whole body, legs, head, etc., and found some indications of a very slight group factor.

Cox's recent work² practically clears up the issue. Success in manual operations is partly a matter of 'g,' partly of 'm' (mechanical aptitude), but also partly of a group manual dexterity factor and a specific dexterity factor. The influence of 'g' and 'm' in routine work is practically negligible, so that the measurement of dexterity there assumes importance. We must distinguish between routine assembly and packing work on the one hand and mechanical assembly—requiring solutions of problems as to how parts must be assembled—on the other. The latter involves some 'g' and more 'm' (see p 60). The former is largely a matter of group and specific dexterity factors. When the work is complex (not intellectually complex, but complex in movement), the group manual dexterity factor is most important, but when it is simple (as in Perrin's experiment) the specific factors are alone important.

Therefore for complex routine assembly of any kind a test of the manual dexterity factor will be valuable, but selection for simple operations is better made on a test resembling as closely as possible the operations to be carried out.

Little is known as to whether we are dealing in manual dexterity with an inborn or an acquired ability factor (though systematic interest is, of course, important in developing the actual ability), but Cox's results show definitely that the order of skill obtained on dexterity tests with unpractised subjects remains essentially unchanged after any period of practice. The absolute difference is, however, reduced, owing to those with poor initial ability being relatively more improvable. Boys do better than girls in tests in which strength and speed of movement are

¹ "The Measurement of Motor Ability," *Arch. of Psychol.*, 1923, No. 62.

² *Manual Skill, its Organisation and Development*, Camb. Univ. Press, 1934

GRADE I

FIG. 20.

required, but girls do better when independent finger control is concerned.

Any of these tests may be invalidated by practice.

TESTS OF MANUAL DEXTERITY

The following three tests are the best arising from Cox's recent research, and may be used as one battery requiring about 30 minutes (median) and yielding a very fair measure ($\cdot 8$ correlation) of manual dexterity factor.

Eye-board Test I.—Individual test, but can be used with a group up to about 6 persons. A board 15×16 inches containing 10 rows of 9 eyes in a row. A spool with a lace round it lies at the end of each row, and a clip stands at both ends of each row. Subject is required to unclip the lace, unwind it from the spool, thread it through the eyes, and clip it up at the other end of the row—for each of the 10 rows. Scored (*a*) on time to complete, or (*b*) on number of eyes threaded in 3 minutes. This is perhaps the best test yet devised for measuring the general manual dexterity factor running through manual assembly tests. It correlates $\cdot 80$ with this factor 'd' (among school-leavers 14 years), has a consistency coefficient of $\cdot 90$, and no correlation with 'g' (see J. W. Cox's research in *Manual Skill*, Camb. Univ. Press). Apparatus from J. W. Cox, c/o Methuen & Co., Essex Street, London.

Norms.—(*a*) Time Method. Median for 14-year-old elementary school boys : 14 minutes 10 seconds.

(*b*) Number of eyes in 3 minutes : Twelve-year-old elementary school boys. Median, 85 eyes. Upper quartile, 93 eyes. Lower quartile, 74 eyes.

Fourteen-year-old intermediate school boys. Arranged in five equal intervals (binomial expansion), (i) 67 eyes and under, (ii) 68–87 eyes, (iii) 88–99 eyes, (iv) 100–115 eyes, (v) 116 and over.

A shortened form of this test. Eye-board Test II is available, in which a short practice period is included.

Pin-board Test.—Consists of a board 12×12 inches furnished with 64 brass pins and a terminal clip. Subject

is required to wind with right hand a given ball of string, held in left hand, over each pin until the terminal clip is reached. Score = time to complete, thrice.

Norms.—Median for 14-year-old elementary school boys: 8 mins. 55 secs. Consistency, 0.90 Correlation with general manual factor, about .5. Material from J. W. Cox, c/o Methuen & Co.

Pin-stick Test.—Consists of a stick 12 inches long, 1 inch square, mounted on a handle. 10 'pins' (nails) along each side of the stick. Subject winds string round the nails with right hand while holding stick with left hand. Done thrice. Score = total time taken.

Norms.—Median for 14-year-old elementary school boys. 6 mins. 26 secs.

The following tests have negligible correlation with the general dexterity factor, but are of value in measuring specific dexterities¹ (closely related to the test itself).

1. *Nut and Bolt.*—A test having a correlation of .3 to .4 (the best of Earle's and Gaw's tests) with skill in the work of smith, fitter, carpenter, and electrician. Two small cardboard boxes each containing 10 small screw-bolts and 10 nuts made to fit these. Nuts and bolts unfastened and all mixed together, placed in heap on table. Instruction "Screw these nuts on the bolts—until they are tight—as quickly as you can" (show how to 'spin' the nuts with the finger).

Score = average time for two trials (i.e. two boxes).

The following deciles are for 14-year-old elementary school children and are derived from the histograms of Earle and Gaw for 200 children.

<i>Decile</i>	1	2	3	4	5
Boys	Below 78	78 - 84	84 - 92	92 - 96	96 - 102
Girls	Below 101	101 - 111	111 - 119	119 - 130	130 - 141
<i>Decile</i>	6	7	8	9	10
Boys	102 - 111	111 - 119	119 - 127	127 - 143	143 and over
Girls	141 - 148	148 - 160	160 - 169	169 - 181	181 and over

2. *Peg Board.*—A test correlating .34-.38 with skill as smith or carpenter. Apparatus: a board, slightly more

¹ Earle and Gaw, *op cit*, p. 55

than 10 inches square, with 10 rows of holes, 10 holes in each, 1 inch apart. Set of wooden pegs (10 or more), 2 inches long, $\frac{1}{4}$ inch in diameter, round. Board placed in front of subject and clamped to the table. Half of the board (5 rows of holes) nearest to the subject is covered with piece of paper fixed by drawing-pins. Instructions: "Begin here (top left), and put pegs in top row (indicate), using only your thumb and middle finger." Pegs to be picked up separately. Repeat (1) with thumb and third finger, and (2) with thumb and fourth finger. Record time taken and number of pegs dropped. Score = time for all three performances, plus 3 seconds for each peg dropped. The following norms (after Earle and Gaw's histograms for 200 children) are for 14-year-old primary school children.

<i>Decile</i>	1	2	3	4	5
Boys	Below 90	90-97	97-101	101-108	108-111
Girls	Below 88	88-94	94-99	99-102	102-109
<i>Decile</i>	6	7	8	9	10
Boys	111-117	117-122	122-128	128-150	150 and over
Girls	109-118	118-125	125-135	135-148	148 and over

The Seguin Form Board (see p. 29); and the *Leake-Smith Figure Board* (see p. 31) have also been found to yield useful correlations with skill in packing and sorting. For adult norms see *The Scientific Selection and Training of Workers in Industry and Commerce*, by M. Martin-Leake and Thyra Smith (Pitmans).

OTHER DEXTERITIES

Press, Foot, and Hand Co-ordination.—An instrument devised and standardised by the National Institute of Industrial Psychology for testing dexterity of press machine workers. Obtainable from Messrs. Stoelting.

Touch Placing Test.—An instrument devised and standardised by the National Institute of Industrial Psychology to measure a subject's skill in placing and adjusting objects without visual aid, as in various industrial processes. Obtainable from Messrs. Stoelting.

LOGICAL ABILITY

As has been stated at the opening of this chapter, there are good grounds for supposing that ability to deal with evidential relations is partly a specific ability. It is commonly assumed that this logical ability is more highly developed in men and women, and the few researches so far carried out would appear to confirm this.

The tests described below will obviously be pretty highly saturated with 'g.' It is suggested that a measure of the 'logical ability' which they also contain would best be gained simply by dividing the 'Reasoning' score by the mental age, previously determined by an intelligence test.

Bristol Group Reasoning Tests.—For children. A and B Forms, fifteen items on each. Practice Sheet by Barbara Dale (University of London Press).

Burt's Graded Reasoning Tests.—Two inference items for each year from 7 to 14 inclusive. Well standardised and carefully freed from specialised knowledge. Material and instructions in *Mental and Scholastic Tests*, pp. 237-42.

Fox's Reasoning Tests for Students of University standing. See C. Fox's *Practical Psychology*.

Noll, J. H., "Measuring Scientific Thinking," *Teachers' Coll. Record*, 1934, No. 35. Describes a test of 134 items to test five habits of thought: accuracy, suspended judgment, open-mindedness, intellectual criticalness, habits of looking for cause and effect relationships. Reference to an incomplete standardisation.

MECHANICAL APTITUDE

Most tests of 'Mechanical Aptitude' have in the past been, at least in part, tests of mechanical knowledge and experience—or even of manual dexterity—and have accordingly been classified in the "Achievement Tests" section of this book. The only really satisfactory test—at least in this country and probably in America too (with the recent possible exception of the Minnesota Mechanical Aptitude Test)—is that of Cox, based on the very

thorough investigation described in his monograph *Mechanical Aptitude, its Existence, Nature, and Measurement*.

Battery for Boys 11-14 Years.—The following tests—Test I, Test II, Test D, and Paper Folding A—are the only tests which are easy enough for Junior Scholarship children. It is suggested that they be used as one battery, but since each is standardised separately, one or two can be chosen and, in the writer's experience, Test I and Test D form quite a useful combination.

Test I.—Five wooden models. Can be used with groups or individuals. Selective answers (on printed diagrams). Fifteen answer items. Time required, 20 minutes. Norms for primary school children 11-14 years and technical schools 13-16 years.

Test II.—Five models supplementing the above. Fifteen (selective answer) items (printed diagrams) in booklets. Time, 15 minutes. Norms as for Test I.

Test D.—Six diagrams. Insight into mechanism. Scored on 30 answer items. Time, 35 minutes. Norms for Technical Schools.

Paper Folding A.—Cutting of folded papers (as in Binet Test). Score of 79 items. Time, 35 minutes. Norms for primary school children 11-14 years, and technical schools 13-16 years.

Battery for School Leavers, 14-16 years

Test M.1.—Ten mechanical (wooden) models. Selective answers on diagram booklets. Scored on 46 items. Time 35 minutes. Norms for primary school children 12-14 years (for whom it is rather on the difficult side) and for adult students.

Norms for Secondary School Leavers, Boys, 16 years (from F C Thomas)

Decile.	1	2	3	4	5	6	7	8	9	10
Score	4-7	7-9	9-12	12-13½	13½-15	15-17	17-19	19-21	21-26	26-40

Test D.—As above.

Test E.3. (Form B) (superseding shortened Form A).—Mechanical Explanation. Selective answers in booklets. Score 49 on 31 items. Time, about 40 minutes. Norms for 14-15-year-old boys.

Paper Folding B.—As Folding A above, but more difficult. *Norms* for a shortened test (1 hour 10 minutes) for 14-year-old boys. The following five-point (method of equal units) division is based on the scores of over 400 elementary and intermediate school boys divided into five sections according to a normal distribution curve, i.e. in the proportion 1 : 4 : 6 : 4 : 1 :

Point Score	I	II	III	IV	V
Raw score in marks (Models and Diagrams combined)	0-6	7-12	13-20	21-31	32 and upwards

Battery for Selection among Engineers

Test M.2.—Ten mechanical models. Selective answers, giving score on 66 items. Time, 40 minutes. *Norms* for Technical College Students 14-16 years.

Test C, Form B.—Mechanical completion test on diagrams, etc., in booklets. Score on 48 items. Time required, 35 minutes.

Paper Folding B.—As above.

Each of the above three batteries includes a model test, a diagrams test, and a paper-folding test, and requires about 1 hour 50 minutes to administer (which includes time for distribution, etc.). It is inadvisable to cut the battery down to less than 1 hour.

All the above models, diagrams, booklets, etc., may be obtained from Dr. J. W. Cox, c/o National Institute of Industrial Psychology.

MUSICAL APTITUDE

Research indicates clearly a specific factor, or rather a group of specific factors over and above 'g' in determining success in music. Indeed, this special factor weighs the issue in musical success almost as much as 'g.' Nevertheless, there is yet no evidence as to whether such talent is innate or acquired. The experiments of Professor C. E. Seashore and his school stand out above all others in this field, and present a very complete investigation which has led to the only test available, viz. :

*Seashore's Musical Talent Test.*¹—A set of six phonograph records testing the following essential capacities with the consistencies indicated by the coefficients.² Pitch Discrimination, .71; Intensity Discrimination, .65; Time sense, .48; Consonance Appreciation, .43; Memory for melodies, .59; Rhythm sense, .29. Of these, memory correlates most highly with music teachers' estimates of ability. The correlation of estimates with all tests together (pooled) appears to be about 0.4, but this may be no reflection on the tests. The effect of musical training on test performance is not marked.

Stanton and Koerth³ found correlations of $.45-.83 \pm .02$ between test scores before and after training the group.

The test, which, of course, is one of appreciation, not of motor performance on musical instruments, is a group test, and can be used with adults and older children down to the age of about 11 years. Norms permit of allowance for practice, age, and intelligence. Material obtainable from Messrs. Stoelting.

MEMORY

Although a 'good memory' is a factor constantly considered in selecting for employment and a 'bad memory' is a symptom to be assessed in borderline neurotic conditions, research shows that we are dealing with a complicated function rather than the single ability in which the above expressions would lead one to believe.

Effect of Intelligence.—Most reports on mental defectives include the remark, "Has a very poor memory." Statistical enquiry shows medium correlation of intelligence and memory. Actually with meaningful material (e.g. prose passages, commissions) the correlation with 'g' reaches .3-.4, but with unrelated or sensory material (objects, colours, strings of numbers) or mechanical skills, it is

¹ See e.g. C. E. Seashore and H. Mount, *Psych Monog*, No 108, 1918

² A. W. Brown, "The Reliability and Validity of the Seashore Tests of Musical Talent," *J Appl. Psychol*, 1928, xii

³ "Musical Capacity Measures of Adults repeated after Musical Education," *Univ of Iowa Studies*, 1930, xxxi. See also J. Kwalwasser, "Tests and Measurements in Music," *Psychol. Bull*, 1928, xxv, D. L. Larson, "An Experimental Critique of the Seashore Consonance Test," *Psychol Monthly*, 1928, xxxviii.

practically zero, i.e. good memory is as likely to occur with low as with high I.Q.s.

Varieties of Memory.—One must distinguish first between committing to memory (amount remembered immediately) and retentivity as such. The latter is most simply measured by the 'Memory Ratio' (Moore) which compares the amount known immediately after memorising with the amount known some considerable time after.

It is the latter which is most independent of 'g.' But we may scarcely speak of retentivity as a whole since there is only a slight general factor running through retentivity (about $\cdot 1$ – $\cdot 2$ intercorrelation), whilst group factors are quite large. The known group factors are: (1) sensory memory, common e.g. to sensory memories from auditory and visual sources. Intercorrelation about $\cdot 3$ – $\cdot 4$; (2) verbal memories. Intercorrelation $\cdot 4$ – $\cdot 5$; (3) non-verbal symbolic memories, e.g. for digits. Intercorrelation $\cdot 6$ – $\cdot 7$. Apparently there is no ground for supposing that long distance and short distance memory are distinct abilities.¹

To predict a person's capacity to memorise in any particular field would seem to be possible from a measure of his intelligence, his general retentivity, and his specific retentivity. General psychological considerations suggest, however, that a person's retentivity is not a fixed measurement like his intelligence, but something likely to alter with any considerable change of health or emotional adjustment. Again, we are dealing with something highly responsive to the emotional forces of the person's conscious and unconscious purposes and life plan. A man of good intelligence and retentivity may yet forget his own name.

With these modifying factors in mind, the following test of the general retentivity factor may be used for what it is worth to give fairly significant predictions.

It is important that the same strength of motive to remember should as far as possible be stimulated in each subject.

¹ This conclusion and the above figures are based mainly on Spearman's *Abilities of Man*, chapter xvi on "Retentivity of Dispositions"

RETENTIVITY TEST

Consists of four parts. In each the subject is simply instructed to commit as much as possible to memory. (1) Page of Pictures. Expose for 30 seconds. Test number of items recalled immediately afterwards. (2) Page of Nonsense Syllables. Expose for 30 seconds. A series of twenty cards is then exposed, in an irregular mass, and the subject is asked to pick out those which occurred on the sheet. See cards on p 68. (3) A Page of Shapes. See p. 69. (4) The following list of words is read out twice, at rate of about 1 per second: Horse, Laugh, Strong, Cruel, Car, Brave, Love, Fight, Talk, Boy.

In each sub-test 1 minute is allowed for recall, and the score is the number of items right minus the number wrong.

The recall is tested again after the lapse of 1 hour (the subject not being specifically informed of this intention—only ‘memorise’).

Retentivity Score = Number of first recall subtracted from number on second (all tests pooled). Therefore negative and numerically greater for poorer retentivity.

Norms.—There are as yet no adequate norms. For children between 10 and 14 years the mean is about -5 and the quartiles at $-2\frac{1}{2}$ and -8 . Ability to memorise, plus Retentivity, i.e. ‘power of memory,’ goes on increasing throughout childhood and up to about 30 years of age, after which it declines slightly, but Retentivity probably shows lesser growth variation.

SOCIAL INTELLIGENCE

Owing to its importance for vocational guidance and the selection of persons for administrative and human contact occupations, ‘social intelligence’ has been the subject of a considerable number of tests, though none has been standardised in this country. No one has proved the existence of or defined this social intelligence, and experiment reveals that the tests are in fact merely more or less

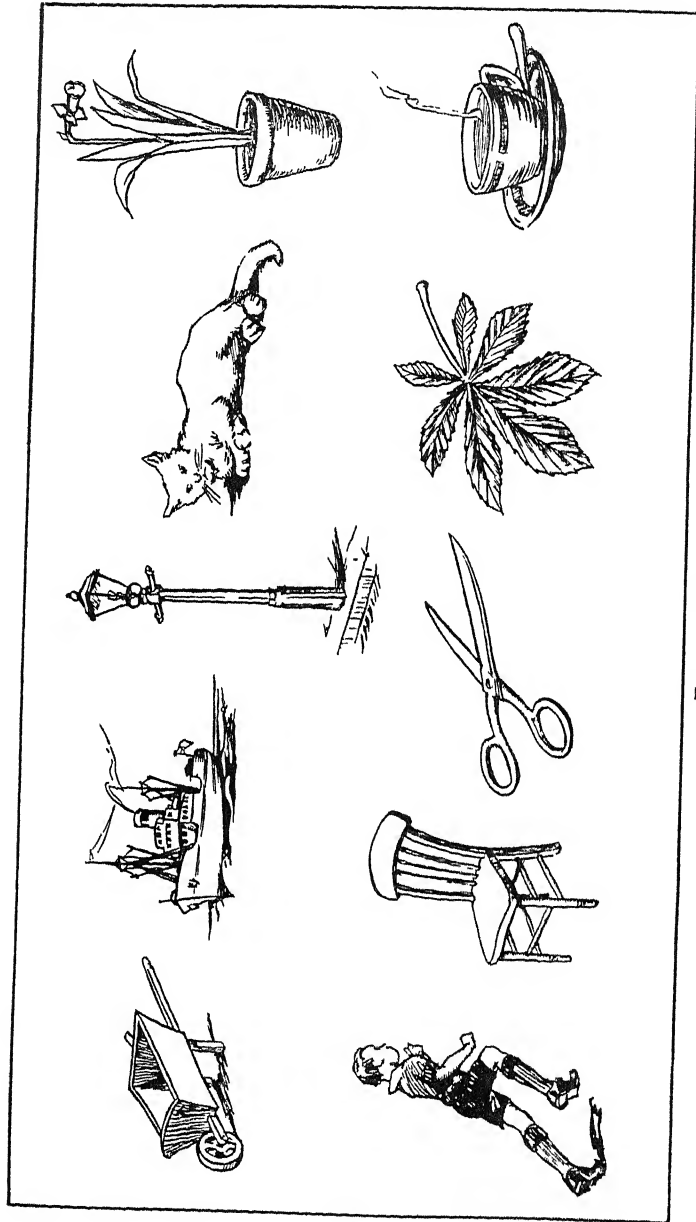


FIG 25 —TEST I

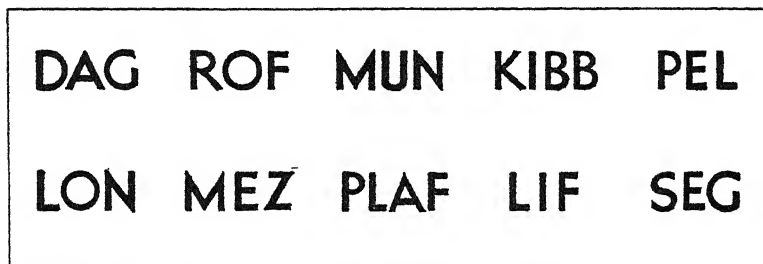


FIG 26 —TEST 2 —Memorise these syllables

good measures of ordinary 'g.' Thus Strang¹ found a correlation of .44 with ordinary intelligence tests and concluded that apart from this the tests were measuring only the informational side of social intelligence.

Probably social intelligence is, over and above 'g' itself, essentially a matter of information and skill relating to psychological situations, depending on experience gained through temperamental bent and early interests. Almost certainly a measure of surgency of temperament (p.148) would correlate with success in handling social situations (among people of equal 'g'). An additional test will be found in the social and human interests section of the Interests Test (p. 121).

The basis for further tests in a composite battery lies in the picture interpretation tests of Binet,² the suggestions of Spearman,³ and the sequence tests of Decroy.⁴ (Most of the Picture Completion Tests—Healy, Fernald, Pintner—seem to the present writer not to be sufficiently replete with psychological relationships to be included in a Social Intelligence battery.) There are also the Problematical Situations tests of Webb⁵ which might readily be extended and standardised to form part of a battery for adults. Finally, there are Ruckmick's (listed below) and others' tests of ability to judge emotional expression—an essential part

¹ R. Strang, "Relation of Social Intelligence to Certain Other Factors," *School and Soc*, 1930, xxxii, pp 268-72

² *Année Psycho*, 1905, xi, "Interpretation" A Binet.

³ Spearman's *Abilities of Man*, picture facing p 181

⁴ *Année Psycho*, 1914, xx

⁵ *Brit J Psychol Monog*, *Suppl*, 1915, No 3



FIG 27 —TEST 2 —Pick out the cards bearing the syllables you have already seen

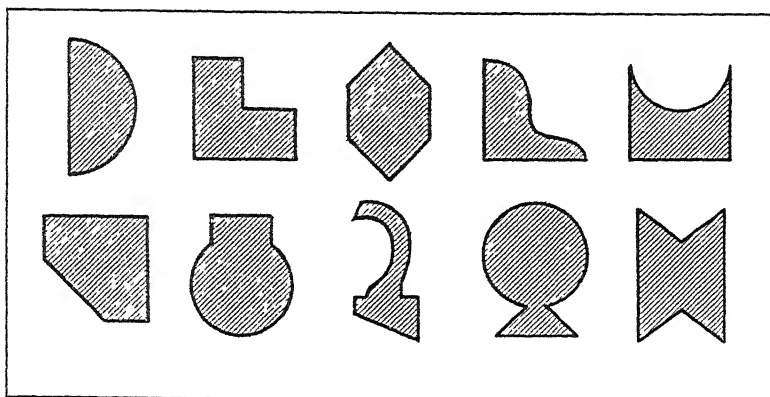


FIG 28 —TEST 3 —Memorise these shapes

of practical social intelligence, but also possibly largely ordinary 'g.'

The tests described below, although not necessarily as sound as the battery suggested here, are already in a prepared (and generally in a standardised) form.

Clearly much research remains to be done both in proving the existence and nature of psycho-social aptitude and in devising tests.

For Children

Schwartz's Social Situation Picture Test.—For boys and girls of 9–13 years. Six pictures for girls and 8 pictures for boys. "What is the boy (girl) thinking of (or about to do)?" Standardised presentation but not standardised scores from the point of view of social intelligence. First part of question on each picture could be used as group or individual test and readily standardised. Second part definitely intended for individual psychiatric interview (see Projection Tests, p. 175), and not usable for above purpose. About 15 minutes required. Material: Messrs Stoelting.

For Children and/or Adults

Test of Social Intelligence.—(Partially Standardised.) Bureau of Public Personnel Administration Staff; *Public Personal Studies*, 1930, U.S.A.

George Washington University Social Intelligence Test (Secon-

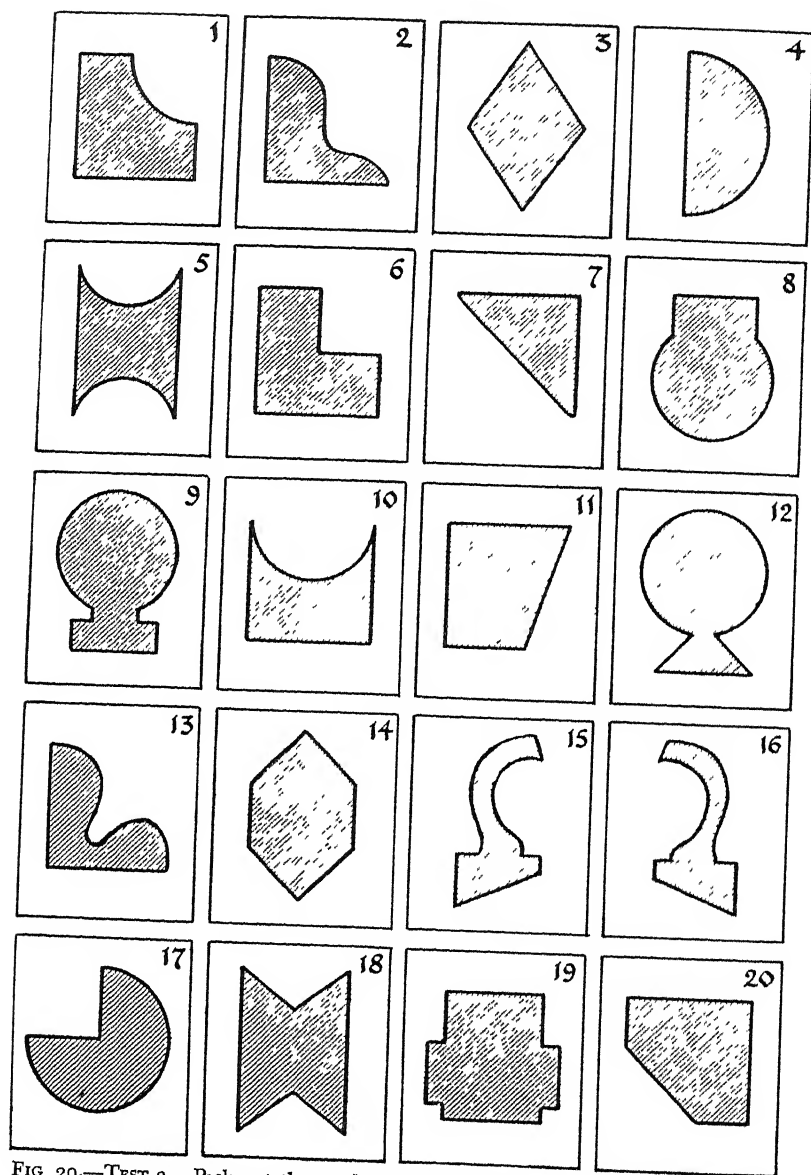


FIG 29.—TEST 3.—Pick out the cards bearing the shapes you have already seen.

dary School and College).—Obtainable: Centre for Psychological Service, Washington, D.C. See also "Ethical Discrimination Tests" (Chapter VI).

*Ruckmick's*¹ *Emotional Expression Pictures*.—A series of 32 photographs of a female face expressing laughter, scorn, fear, grief, etc., etc. They are of sufficient difficulty for the average adult to fail in about 50 per cent. of his judgments as to the emotion depicted, but can be made still more difficult by covering the upper or lower half of the face. Kindergarten children nevertheless pass quite a number—especially those dealing with primary emotions.² No norms are yet available. These could be readily built up, the present writer suggests, on a basis of 30 seconds' exposure of each picture (including time to write down word describing the emotion). Group or individual test. Ruckmick's key supplied with material. Material from Messrs. Stoelting. (In this connection there are also photo series by Rudolph (18 male expressions), perhaps not so satisfactory as the above, and Feleky (24 female).) Also Hickson's and others' photos of delinquents, etc., for judging ability to judge character. Obtainable: Messrs. Stoelting.

SPATIAL SENSE (VISUAL)

As stated in the introduction to this chapter, most research seems to show that no such 's' as a 'Spatial sense' exists.³ This finding is based on measurements of success in all kinds of form board tests—which prove to have no common factor other than 'g.' Nevertheless, many psychologists seem obstinately to feel that such a power exists, and recent research by Stephenson⁴ and El Koussy⁵ has definitely demonstrated the existence of a minor group factor 'k' concerned with the perception and fitting

¹ See Ruckmick, "A Preliminary Study of the Emotions," *Psych Monog*, xxx, 1922

² See Gates, "An Experimental Study of the Growth of Social Perceptions," *J Educ. Psychol*, xiv, 1923.

³ See e.g. Spearman, *Abilities of Man*, chapter 10

⁴ "A Note on the 'Purification' Technique in Two-factor Analysis," W. Stephenson *Brit J Psychol*, xxvi, 2, 1935

⁵ "The Visual Perception of Space," A H El Koussy (Camb Univ Press).

of spatial patterns. This may be the same as Alexander's 'F' factor¹ (see p. 42) or it may be an ability to think in visual spatial terms; an ability which would be high in the old 'visual imagery' thinking type. Proneness to intense visual imagery, especially 'eidetic' imagery, is, we know, partly a matter of temperament and of age and practice in verbal thinking (diminishing with these), but some other 'visual thinking' factor may exist. Much research needs to be done; none has disproved the existence of such a factor; some points to its presence.

A test designed to test such an ability is:

Form Relation and Memory for Designs Test of the National Institute of Industrial Psychology. It consists of eight sub-tests of ability to recognise the 'fit' of plane and solid shapes along with a ninth test of ability to memorise shapes. It is frequently used as a test of aptitude for dress-making or to measure other abilities in girls corresponding to mechanical ability in boys, but how successfully no one knows. It can be used for 12-14-year-olds or adults, requires about 40 minutes to give, and is intended for use as a group test. Booklets from National Institute of Industrial Psychology.

Norms (from N I I P) for 13-14-year-old children

<i>Deciles</i>	1	2	3	4	5
Score on Form Relations	Below 18	18-19	19-21	21-23	23-25
Score on Memory for Designs	Below 25	25-28	28-30	30-32	32-34
<i>Deciles</i>	6	7	8	9	10
Score on Form Relations	25-27	27-29	29-31	31-34	34-upwards
Score on Memory for Designs	34-36	36-38	38-40	40-42	42-upwards

For 15-16-year-old children

<i>Deciles</i>	1	2	3	4	5
Score on Form Relations	Below 24	24-27	27-29	29-32	32-34
Score on Memory for Designs	Below 31	31-34	34-36	36-37	37-38
<i>Deciles</i>	6	7	8	9	10
Score on Form Relations	34-36	36-38	38-40	40-43	43-upwards
Score on Memory for Designs	38-40	40-41	41-42	42-44	44-upwards

VERBAL ABILITY

Since the researches of Kelley and of Stephenson during the last seven years, it has been known that most intelligence tests are measuring a verbal group factor 'v' in

¹ Though 'k' would be the better symbol, since 'F' has already been used for fluency of association.

addition to 'g.' Professor Burt, many years earlier, spoke of 'verbalisers'—children whose ability for verbal expression was obviously far in advance of their intelligence. It is obvious that the measurement of this verbal factor is going to be of the greatest importance in vocational guidance. At present, however, we are far from knowing what its exact limits are, whether it is constitutional, or acquired, or what standards of 'v' endowment are required in various occupations. The trend of research evidence at the moment would seem to indicate that 'v' is a facility, not only with words, but with any form of mental operation with symbols, as distinct from things in themselves. There is as yet no test available, even in rudimentary form, specifically designed to measure this ability. Alexander¹ found a 'v' factor particularly heavy in Thorndike's Reading Test and in the Terman Group Test of Mental Ability. A measure of 'v' might therefore be obtained roughly by observing the differences between scores on these two tests on the one hand and on some satisfactory non-verbal test, e.g. Sleight non-verbal Test (p. 12), or Cattell Scale I, Non-verbal Test (p. 12), on the other.

WIT

The quickness and the creativeness of wit we know to be related to the 'c' factor of temperament. Fairly good correlations should be obtained between wit and estimates of surgency (see p. 149) or wit and measures of fluency of association (see p. 151). As to the variation of wit with age we know little, whilst questions of quality and of individual and social conditions lead one quickly into profound problems of the unconscious and of social psychology. Nevertheless, a rough measure of the amount of wittiness which a person possesses may at times be needed.

A measure of intelligence should first be made, and then a measure of 'f' and 'c' which determine the extent to which intelligence is able to issue as wit. To the impression thus gained may be added for greater reliability a

¹ *Intelligence, Concrete and Abstract*, p. 96, W. P. Alexander (Camb. Univ. Press)

direct measure of wit on the "scale of wit" very carefully selected and standardised by Dr. Wynn Jones in his recent book, *An Introduction to the Theory and Practice of Psychology*. Two series available (p. 101), 18 points in each. Scored on degree of insight and quickness of response. Norms for adult students, secondary and primary school boys.

CHAPTER III

ATTAINMENT TESTS: SCHOLASTIC AND GENERAL

1. The Purpose of Attainment Tests

THE attainment test grew up in the first place out of the attempt, associated in this country principally with the names of Ballard and Burt,¹ to make more reliable and exact the ordinary scholastic examination. In the hands of the psychologist, such tests have acquired a wider use, and may be said to assess any kind of information accomplishment or skill, from size of vocabulary to speed of typewriting or accuracy of shooting.

In spite of the now notorious unreliability of the essay type of examination and of the disquieting blunders which have at length been scientifically revealed in the working of the State and scholarship examinations,² many teachers continue to treasure a pathetic faith in the traditional examination. Indeed, notwithstanding the very cogent arguments for the new instrument that have been set out by Ballard (in the *New Examiner*) and others, the less evolved measure of attainment is still frequently used even in circumstances which definitely indicate the desirability of the attainment test proper. For that reason it may be worth while to summarise the arguments concerning these tests.

(1) The questions in the attainment test are such that answers (usually selective or on the true-false plan) are definitely either right or wrong. Partial scoring and subjectivity arising from the personal factor of the examiner's mood or individuality does not enter.

¹ Since Burt's *Scholastic Tests* and Ballard's *New Examiner* are in every clinic and most schools, I have not thought it necessary to arrange for the reproduction of their tests here

² See, for example, *The Reliability of Examinations An Enquiry*, by Prof C W Valentine, M.A., D.Phil., London, 1933 Or the recent report, 1936, of Sir Michael Sadler's Committee, Carnegie Corporation

Consequently, the correlation of markings by different examiners is perfect, whereas with the essay type of examination it is rarely more than 0.6 (Ballard).

(2) Instead of answering four or five questions in an hour, the examinee now has to answer (without being forced to hurry) perhaps two hundred. The element of luck, through the examiner's picking on favourable or unfavourable questions, is now eliminated, for the examinee has to answer questions concerning the whole range of his course. Where questions are of the true-false type, i.e. having only two alternative answers (and in the more recent attainment tests this is avoided wherever possible), the examinee, admittedly, has an even chance of being right on a large number of questions, but each examinee tends to profit equally from this source of credit. Experiment shows that the reliability (i.e. correlation coefficient) of consecutive testings remains very high, even when this source of error goes uncorrected. By doubling the number of wrong answers and subtracting the figure from the number of right answers, a score is obtained which, on an average, is the number that would have been correct if no answers had been correct through lucky shots.

(3) The attainment test tests attainment only, or, in the words of critics, it fails to test intelligence, the power of organising information, the power of sustained effort, the ability to initiate trains of thought and to express oneself in words. One may doubt whether the power of sustained effort should be included in the list, but, apart from this, it is true that the attainment test, like the intelligence test, tests only one aspect of what is measured by the ordinary examination. Now it is precisely this analytical power of the new tests which recommends them to the teacher-psychologist. If one wishes to test intelligence in a scholarship examination, the proper course is to use an intelligence test. The results may afterwards need to be combined with those from an attainment test, but it is desirable to know how much is contributed by each, for, in a scholarship at 11+, a low attainment score is not significant if the child

happens to come from a school lacking normal teaching advantages, whereas at the university scholarship stage it might be imprudent to admit a scholar, however bright, who was completely lacking in knowledge of some subject which he would need to bring to degree standard in three short sessions.

Other qualities which it is alleged (nothing more) that ordinary examinations test, maybe more certainly measured by temperament and character tests (e.g. "ability to initiate trains of thought," by 'fluency of association' tests, p. 151; steadiness of character by 'perseveration' tests, p. 210).

Doubtless at the root of the irrational passive resistance¹ to the objective attainment test is the fact that many teachers try to use the examination, not as a means of assessment, but as an instrument of training. If examinations are frequent, it is perhaps as well to make them a training in organising and expressing ideas (for admittedly if children are to cram for examinations they will do more harm by cramming for the attainment test than for the essay type of examination²); but if ample training in these habits is already given in the course of education proper, there is every reason to make the examination a reliable attainment assessment only.

2. Technique of Construction

Attainment is frequently expressed in terms of attainment age, the units of which are fixed by the achievement of the average child in that subject at each age. One must never lose sight of the fact that these attainment ages do not rest on a stable and regularly developing biological basis as do mental ages. The latter are different only for different races, but the former vary with every difference of school system, of curriculum or method of teaching. Provided this is borne in mind, it is neverthe-

¹ Not marked everywhere. In America the College of Physicians and Surgeons has already set examinations in this form, with conspicuous success. See Wood, "New Type Examinations in the College of Physicians and Surgeons," *J Person Res*, 1926, v.

² A number of teachers who have read these words in manuscript point out, however, that the ordinary examination, often repeated, can, unlike the attainment test, do considerable damage to style.

less highly valuable to determine attainment standards in age units, especially if the standardisation is based on a system of education that is reasonably widespread, e.g. the primary-school system in this country.

Here the concept of the Accomplishment or Attainment Quotient ($A.Q. = \frac{\text{Attainment Age}}{\text{Mental Age}} \times 100$) and the Educational Ratio ($E.R. = \frac{\text{Attainment Age}}{\text{Chronological Age}} \times 100$) will be found useful, especially in comparing group results. The E.R. will have a fairly close agreement with the I.Q., but the A.Q. is more likely to vary inversely with the I.Q. The quotients need to be used cautiously and by those who are not likely to make rash and unpsychological deductions.

When results are not expressed in attainment ages they may be expressed in percentiles or units of standard deviation in the manner described in the last chapter (p. 48). Such methods are preferable in standardising tests for adults.

Attainment tests permit of being scored in two distinct ways: (1) the method of point scores, and (2) the method of direct comparisons. By the method of point scores one gives points or marks for each item correct and transforms the total score by means of a graph into an attainment age or percentile rank. But some attainments, e.g. handwriting¹ and drawing, speech and deportment, do not readily admit of being dismembered and scored point by point. Then it is that one has to fall back on direct comparisons with a series of models each of which represents a definite step upwards in quality from its next neighbour. Thus Burt obtained drawings of 'a man' from a large number of children and selected from each year the drawing most typical of that age. A child's drawing attainment age can be assessed by sliding his drawing of 'a man' over this gauge until one reaches the model to which it is most comparable.

Similarly, Ballard has devised a ten-point scale of legibility of script writing, though here the steps are based neither on age nor on percentile distribution, but on the estimates of a committee of art teachers and others.

¹ Though Freeman has attempted an analytical scale for this purpose.

Whether one uses point scores or median samples the steps employed may be on a basis of percentiles, equal units, or age equivalents. It is the manner of assessment—whether by total impression or piecemeal and point by point—which distinguishes the direct comparison or ‘median samples’ method from the point score method.

This direct comparison or sample method has the disadvantage that it introduces once more the personal equation of the examiner, though not nearly to such a disastrous extent as in the ordinary examination. Some accomplishments can be assessed by either method. Good-enough has produced norms for drawing based on point scoring; whilst on the other hand English essays have been assessed, more accurately than by a marking technique, through direct comparison with ranked samples.

Obviously the highest ranges of accomplishment in art and literature cannot be assessed by attainment tests in the terms so far evolved for the work of children.

In most attainment tests, the answers are of the selective rather than the inventive type, because of the certainty of scoring which, as pointed out (see p. 4), this method alone gives. Naturally, a person answers more on a selective than on an inventive test, since most people can recognise more than they can recall, but there is no evidence that the ranking of persons by the two methods differs in any way. It is highly desirable that there should be five or six alternative answers to each item, and it is also apparently good technique to give spurious attractiveness to the wrong answers that the ignorant may be tempted by them.¹ Even the position (in order) of the answers seems to affect the frequency with which they are chosen by the ignorant.²

Occasionally the material does not admit of five-response answers, and one has to fall back upon three-response or on true-false answers (two response) in which there is a fifty-fifty chance of being right, even when the examinee is en-

¹ H L Arnold, “Analysis of Discrepancies between True, False, and Simple Recall Examinations,” *J Educ Psychol*, 1927, xviii

² “The Effect of Printed Response Words upon Children’s Answers to Questions in Two-response Types of Test,” by C O Matthews, *J Educ Psychol*, 1927, xviii.

tirely ignorant. Then greater accuracy is obtained by subtracting from the number of items right the number of items wrong, for the latter is probably equal in number to the answers obtained correct by luck.

Although the last-mentioned device practically eliminates differences due to the subjects' greater or lesser temperamental tendency to risk a guess, experiment shows that it is desirable in all selective type tests to issue definite instructions to all examinees either to guess or not to guess. The evidence as to which is better is conflicting. On the whole, and particularly on multiple response tests (say, four alternatives or more), the instruction not to guess seems to produce more valid and consistent measurements. Even if the instruction to make a guess on every item is given, to apply afterwards a correction for guessing is hardly worth the trouble with a five- or six-response test; for the chance of right answers by luck is small, and multiplying the wrong answers by four or five to get a figure to subtract from the number right is a questionable procedure.

Although the instruction not to guess produces slightly better consistency correlations, it is still doubtful whether the validity of the attainment test itself is increased thereby, for we may now be measuring a temperament factor too: the inclination to risk a guess when told not to guess.

To sum up: the instruction to guess is essential in two-response tests, whether guessing correction is applied or not (and generally it should be), but in multiple response tests it is a matter of indifference, though where the multiple responses are numerous (say, six or more alternatives) the instruction not to guess is probably better.

3. Available Material

Since it is in the various branches of English and of arithmetic that measurements are most frequently made, these branches are set out first and in greatest detail. All other tests are classified under subject-headings alphabetically. The material of Burt and of Ballard is not

printed here in detail, since it is already issued in other books¹ available in almost any library.

(A) *English and Arithmetic*

ENGLISH

Ability in English includes many distinct kinds of skill and knowledge. For general purposes, as well as for diagnosing causes of backwardness, it is desirable to assess each separately. There is the skill to read quickly, the ability to spell, the extent of the vocabulary understood; the sense of style and habit of correct grammatical usage and, finally, knowledge of literature and classical speech enrichments. Even these are not strictly defined powers: reading, for example, may mean either the ability to comprehend a passage silently read, or the ability to read words out aloud correctly and quickly with or without understanding. For one purpose we need to assess comprehension; for another, just speed of reading.

Ballard has rightly said that, apart from purposes of diagnosing backwardness, the essay must be the central test of attainment in English, and he has devised an objectively scored test—his ‘construction test’—to measure the kind of artistic skill required in good essay writing.

To assess the attainment age in English of children referred for general backwardness (and with whom the psychologist can only spend a few minutes), the writer has found it best to use a test of Reading Comprehension and of Vocabulary. These are parts of a complete battery of English and arithmetic tests standardised by the writer under the title of Midland Attainment Tests (because they have been standardised in Midland schools, mainly in the City of Leicester). This battery consists of the following parts:

English

Reading Comprehension, 10 minutes
Reading Vocabulary, 5 minutes
Spelling, 10 minutes
Grammar, Style, Construction, 20 minutes.
Knowledge of Literature, 15 minutes

Arithmetic

Mechanical skill, 10 minutes
Information (Method), 60 minutes.

It permits of being administered and scored in two ways:

¹ *Mental and Scholastic Tests*, by C Burt (P S King & Son). *The New Examiner*, by P B Ballard (Univ of London Press)

(1) as a group test, when the score is the number of items right within a certain time limit. This score is converted to an attainment age by means of a table of norms; (2) as an individual test, when, for convenience and for economy of time, the child is stopped when he fails on three successive items. (The items have been graded in order of increasing difficulty.) His attainment is indicated by the point which he reaches when these failures begin.¹ This can be read off at once, for, as in Burt's tests, the attainment ages in years and fractions of a year are set out alongside the items.

The available tests in English are as follows:

1. *Comprehension* (a) *Reading*

Ballard's Test.—Silent reading. Twenty-two brief passages on completion test principle (with little demand on intelligence). Possible score of 50 words. Time, 15 minutes (10 for adults). Norms for ages 9–14 inclusive. *New Examiner*, p. 163.

Burt's Test.—"Read what is on the card (not aloud), and do what it says." Demands on intelligence as far as possible eliminated. Seventeen items. Years, 5–13 inclusive. Most finely diagnostic around 6 and 7 years. (*Mental and Scholastic Tests*, p. 345².) This and all the other attainment tests of Professor Burt have been very soundly standardised on at least 500 children at each age in London schools.

Midland Test (Cattell).—Items up to 5½-year level not included in the group test. In the individual test these items are merely read (aloud), whereas the rest is a test of silent comprehension. Ten minutes allowed for group tests. (*Scoring*: 2 marks for each completely correct answer. Where two or more words have to be underlined in an item *all* must be correct for that item to be counted (i.e. no half marks).¹ In the individual test the attainment age is the point reached when three successive failures ensue, no regard being paid to one and two item failures earlier.

¹ Example of scoring. A child who answers, with only one or two scattered errors, up to and including "Does a boy wear a hat?" and then fails on *three successive items*, would have an attainment age of 7½ years.

² The material for all Burt's tests described here will be found in *Handbooks of Tests* by Burt (P. S. King); also in a much larger volume with research findings, in *Mental and Scholastic Tests*, by Burt (P. S. King). The smaller book has not norms for all tests.

Material

4 Years

(5) A B O I T

(5) to we in

5 Years


(.25) on by it

(25) bun dog ball the

(5) Can a cat see? } yes
no

no

6 Years (.25 per question)

Put a dot in this ring 

We hold a pen between our { fingers
toes
teeth

toes

teeth

Is it true that a sister is always
a girl? $\left\{ \begin{array}{l} \text{no} \\ \text{yes} \\ \text{sometimes} \end{array} \right.$

a girl ?

sometimes

How many legs has a dog? $\left\{ \begin{array}{l} \text{none} \\ \text{two} \\ \text{four} \\ \text{lots} \end{array} \right.$

two

four

lots

7 Years (.5 per question)

Does a boy wear a hat?

{ sometimes
no
always

no

always

When robbers break into a house they
generally come to

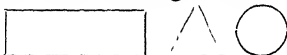
{ sleep
steal
play

8 *Years* (.5 per question)

A cow is bigger than a

{ kitten
horse
tram

Put a cross in the oblong that follows
this full stop.



9 *Years* (.5 per question)


If you lift your hands above your head are
they above your shoulders?

{ yes
no
nearly

The land was so flat that the rain which
fell lay on the ground in great

{ heaps
rivers
pools

10 *Years*

Take this paper and turn it right round, so that the
bottom is at the top. Then write a capital letter P in this
square  . After that turn the paper the right way
again.

11 *Years* (.5 per question)

Draw as quickly as you can a straight line under the last
word in this sentence.

Which of the following animals is most commonly kept
as a pet in civilised countries?

Camel Cow Dog Horse

12 *Years*

Natural, barbarian, again, plate.

Each of these words has the letter 'a' in it. Find out
which contains it the largest number of times and draw a
line under the whole word.

13 *Years* (.5 per question)

At first the swan left its nest and swam angrily in little
circles around the intruder, beating the water with its

wings, but, finding its efforts useless, it soon rose in the air and flew swiftly away.

It had {built
abandoned
eaten} its own nest.

The preceding examples have required you to indicate one answer only. In this instance, however, you are asked to underline two words, namely, 'preceding' and 'required' above.

14 Years

He rose at dawn and fired with hope,
Shot o'er the seething harbour bar
And reached the ship and caught the rope
And whistled to the morning star.
And while he whistled long and loud,
He heard a fierce mermaiden cry,
"O boy, though thou art young and proud,
I see the place where thou shalt lie"

The mermaid's prophecy would most likely bring to the boy a sense of {hope.
adventure in foreign parts.
danger from drowning.
pride in his ship.

Norms for Group Test

Attainment age	6	7	8	9	10	11	12	13	14
Score in marks	13	100	141	178	210	242	275	304	340

Gates's Primary Reading Tests (see *Teachers' Coll. Record*,¹ 1926, xxviii) for diagnosis of reading disability. Arbitrary sub-divisions as into (i) paragraph mastery, (ii) reading to predict outcome of future events, (iii) reading to understand precise directions, (iv) reading to note details.

Northumberland Standardised Tests. (1925 series) Burt, Set II, English. Group or individual. 49 minutes. (7 on each sub-test.) Ages 7-14 years.—Obtainable from University of London Press, Ltd.

Williams's Junior Scholarship Tests, I English. (b) Reading. Obtainable from Messrs. G. G. Harrap & Co.

2. Speed, Accuracy, etc.

Burt's Test.—(a) *Accuracy*.—Ability to read aloud cor-

See also *Gates's The Improvement of Reading*, Macmillan

rectly. 110 words in graded series. Ages 4-14 years inclusive. Ten words at each age. Attainment age that at which child passes more than half of items. An individual test. Also a sub-test of accuracy of knowledge of figures and letters.

(b) *Speed*.—200 monosyllables, continuous and uniform in difficulty. Norms for number of words read aloud in 60 seconds. Instruction to read rapidly. Individual test.

(c) *Speed, Accuracy, and Comprehension Combined*.—A paragraph, timed, with questions to follow to test comprehension. Mainly monosyllables.

Ballard's Test.—*Accuracy*.—One-minute reading scale. Mainly monosyllables (158 words), but graded to larger words. Instruct to read aloud rapidly. 1 minute allowed. Norms for $5\frac{1}{2}$ years to 16. (*New Examiner*, p. 145.) One scale for boys; another for girls.

Northumberland Test.—See above, p. 85.

3. Vocabulary

Midland Test 2 (Cattell).—A silent reading test to determine the size of vocabulary in respect of understanding the meaning of words seen (note that speaking vocabulary is smaller than the 'understood' or reading vocabulary). Group or individual test. 5 minutes allowed.

Group Test Scoring.—1 mark for each correct item.

Norms for Group Test

Attainment age .	6	7	8	9	10	11	12	13	14
Score in marks .	13	100	141	178	210	242	275	304	340

Individual Test Scoring.—As shown below, e.g., a child who stops¹ after answering the first seven items has an attainment age of $7\frac{1}{2}$.

Materials for Reading Vocabulary Test

6 Years (·2 per question)

1. A King is a	{	dog
		man
		flower

¹ i.e. fails on three successive items. This is taken as the point of failure in all the Midland Tests when given individually

2. A peach is a $\left\{ \begin{array}{l} \text{fruit} \\ \text{place} \\ \text{toy} \end{array} \right.$
3. Copper is a kind of $\left\{ \begin{array}{l} \text{bird} \\ \text{wood} \\ \text{metal} \end{array} \right.$
4. To drip means to $\left\{ \begin{array}{l} \text{sing} \\ \text{drink a lot} \\ \text{fall in drops} \end{array} \right.$
5. Newts are found in $\left\{ \begin{array}{l} \text{fireplaces} \\ \text{pools} \\ \text{coal-mines} \end{array} \right.$

7 *Years* (.25 per question)

6. Haste means the same as $\left\{ \begin{array}{l} \text{flour} \\ \text{straw} \\ \text{hurry} \end{array} \right.$
7. A dungeon is a $\left\{ \begin{array}{l} \text{ship} \\ \text{prison} \\ \text{club} \end{array} \right.$
8. Reins are used on a $\left\{ \begin{array}{l} \text{ship} \\ \text{horse} \\ \text{motor-car} \end{array} \right.$
9. Impolite means $\left\{ \begin{array}{l} \text{silly} \\ \text{quick} \\ \text{rude} \end{array} \right.$

8 *Years* (.5 per question)

10. A juggler is a $\left\{ \begin{array}{l} \text{wild animal} \\ \text{man} \\ \text{pirate} \end{array} \right.$

11. To insure means to $\left\{ \begin{array}{l} \text{make certain} \\ \text{hurt someone} \\ \text{lose money} \end{array} \right.$

9 *Years* (.5 per question)

12. To conceal means to $\left\{ \begin{array}{l} \text{make} \\ \text{break} \\ \text{hide} \end{array} \right.$

13. Hysterics are a kind of $\left\{ \begin{array}{l} \text{flower} \\ \text{fit} \\ \text{instrument} \end{array} \right.$

10 *Years* (.5 per question)

14. Shrewd means $\left\{ \begin{array}{l} \text{cross} \\ \text{tired} \\ \text{clever} \end{array} \right.$

15. To quake means to $\left\{ \begin{array}{l} \text{shake} \\ \text{talk} \\ \text{run} \end{array} \right.$

11 *Years*

16. Candid means $\left\{ \begin{array}{l} \text{sugary} \\ \text{frank} \\ \text{tinned} \end{array} \right.$

12 *Years*

17. To repose is to $\left\{ \begin{array}{l} \text{rest} \\ \text{reply} \\ \text{make a face} \end{array} \right.$

13 *Years*

18. A declivity is a $\left\{ \begin{array}{l} \text{part of a ship} \\ \text{liking} \\ \text{slope} \end{array} \right.$

14 *Years*

19. Tedious means $\left\{ \begin{array}{l} \text{ill} \\ \text{tiresome} \\ \text{cross} \end{array} \right.$

(b) *Spelling*

Ayre's Spelling Scale.—Compiled of the 1,000 most common words in the English language, classified in 26 sections of increasing difficulty. A sound scale for making a very thorough examination of spelling achievement and requiring about an hour. Well-founded norms, arranged for school standards. Material in Ballard's *Group Tests of Intelligence*.

Burt's Test.—(a) Actually labelled *Vocabulary Test*. No time limit. Ages, 5–14 inclusive. Ten words at each age. Attainment age that at which more than one-half of words are correctly written. Words dictated by teacher with repetition when necessary. (*Mental & Scholastic Tests*, pp. 287 and 402 for norms.)

(b) *Dictation*.—No time limit. Use of phrases and sentences instead of isolated words, to avoid ambiguity. Continuous, but graded material scored by number of letters correct. Norms (*Mental & Scholastic Tests*, p. 403), ages 6–14 inclusive.

Midland Test 3 (Cattell).—Each word to be read out twice. (Since 10 minutes is allowed for the whole test, this means spending about 15 seconds on each word.) Group or individual test. In the individual test the child scores the indicated attainment age when he passes *all* the words opposite that age before failing in three consecutive items, e.g. failure in 'blind,' 'family' and 'point' gives a seven-year performance.

5 years.	in	we	do	go	out
6 years.	can	may	did	door	grow
7 years.	ball	last	about	child	
8 years.	blind	family	point	perhaps	
9 years.	protection	motion	frighten		
10 years.	punishment	continue	portion		
11 years.	construct	wander	lonely		
12 years.	passenger	shepherd			
13 years.	manufacture	deceiving			
14 years.	intelligent	impatient			

These additional graded words are to be used for higher attainment ages and are to be added to the above list in the group test:

community, guardian, referring, liquefy, ecstasy, marriageable, unnecessary, spatial.

Scoring.—1 mark for each correctly spelt word.

Norms for Group Test

Attainment age	5	6	7	8	9	10	11	12	13	14
Score in marks .	05	70	120	165	200	230	264	290	310	331

Note that the norms at 5 and 6 in this test will vary greatly with the general aims and methods of the infant school, notably with the age at which formal reading and writing begin.

Schonell's Tests.—A series of standardised spelling tests and graded remedial material. Based on extensive research, and probably offering the best test available in this country for diagnosing and remedying the causes of spelling disabilities. Material in *Essentials in Teaching and Testing Spelling*, by J. Schonell (Macmillan, 1932).

(c) *Grammar, Style*

Here one aims, not at testing explicit knowledge of grammar or grammatical nomenclature, but at assessing acquired skill in grammatical usage and the (psychologically closely related) sense of style.

Ballard's Test. (Called English 'Comprehension,' p. 172 of the *New Examiner*.)—This test also includes tests of vocabulary. 100 items. A matter of indicating better alternatives in sentences, etc. 1 hour required. Norms for ages 10–14 inclusive.

Midland Test 4 (Cattell).—Deals with general knowledge of how English should be written—grammar, style, phrase arrangement, punctuation. Not arranged for scoring by 'point of failure' method. 20 minutes required.

Items

Put a line under the best word, wherever two or more words are given.

1. $\left. \begin{array}{l} \text{Wear} \\ \text{Where} \\ \text{Were} \end{array} \right\} \text{ are we ?}$
2. $\left. \begin{array}{l} \text{There} \\ \text{Their} \end{array} \right\} \text{ is no more.}$
3. They knew $\left\{ \begin{array}{l} \text{we} \\ \text{us} \end{array} \right\}$ two had done it, for they
saw $\left\{ \begin{array}{l} \text{we} \\ \text{us} \end{array} \right\}$ come.
4. "I $\left\{ \begin{array}{l} \text{shall} \\ \text{will} \end{array} \right\}$ drown," cried the distressed swimmer.
- "No one $\left\{ \begin{array}{l} \text{shall} \\ \text{will} \end{array} \right\}$ save me."
5. If you are tired $\left\{ \begin{array}{l} \text{lay} \\ \text{lie} \end{array} \right\}$ down.
6. He had neither hat $\left\{ \begin{array}{l} \text{nor} \\ \text{or} \end{array} \right\}$ coat.
7. The chieftain, with ten warriors, $\left\{ \begin{array}{l} \text{was} \\ \text{were} \end{array} \right\}$ there.
8. Everybody likes to see $\left\{ \begin{array}{l} \text{their} \\ \text{his} \\ \text{one's} \end{array} \right\}$ name in print.
9. $\left. \begin{array}{l} \text{These} \\ \text{This} \\ \text{Those} \end{array} \right\} \text{ sort of people } \left\{ \begin{array}{l} \text{is} \\ \text{are} \end{array} \right\} \text{ no good.}$

In some of the following sentences one or more words are wrong. Put a line under the incorrect words.

10. How much are them apples ?
11. He is the man what done it.
12. I have bought me a new hat.
13. I teached him to read.
14. He don't do what he should.
15. In the park were a row of tall trees.
16. All of us play cricket.
17. Mary and myself will call at the shop.

18. I beseeched him to return.
19. He does it well.
20. None of the boys had a bat of their own.
21. You did not ought to have gone.
22. Each is right.
23. He came with father and I.
24. The boy and not the girls are to blame.
25. Which is the best of the two ?
26. He plays most careful.

27. Punctuate and insert any capital letters that are needed:

the duke dashed up shouting all is lost whats the hurry said
 lord growley hurry exclaimed the dukes standard bearer
 why if were not in france before sunday we shall all be
 dead men so they rode off in haste hoping to reach the
 ships.

In some of the following sentences the meaning is not clear. Underline the words that are in the wrong position:

28. My friend spent Easter shooting at the country house of Lord and Lady Molton.
29. Away he went, like the wind.
30. Please return the book I lent you quickly.
31. I only like him when he is good.
32. "Fast car wanted by a sportsman with four cylinders."
33. "Boy wanted to sell eggs under sixteen years of age."
34. "Lighting fireworks is forbidden in the streets."
35. This is the man whom I sent for.
36. He was glad constantly to tend the fire which burnt well.

Which of the following is the better style ? Indicate by a cross.

37. (a) The man was told to thoroughly clean the garage.

- (b) The man was told thoroughly to clean the garage.
- (c) The man was told to clean the garage thoroughly.
38. (a) Who knows, but in this solitary place
There lies a heart that burnt with fire divine;
A hand of iron, a stern imperial face,
Or skill to turn the sweet melodious line.
- (b) Perhaps in this neglected spot is laid
Some heart once pregnant with celestial fire;
Hands, that the rods of Empire might have
swayed,
Or waked to ecstasy the living lyre.
39. (a) The pearls of the morning dew have fled never
to be found again.
- (b) The pearls of the morning dew have fled never
to come back at any future date.

Scoring.—1 mark for each completely correct answer.

Norms

Attainment age	6½	7	8	9	10	11	12	13	14
Score in marks	4	6 8	8 8	11 0	16 0	19 6	21 3	22 0	22 7

(d) *Composition and Construction*

A good part of this ability is assessable by the Midland Grammar Style Test above, but Ballard has devoted one test entirely to attempting the objective assessment of ability in English Composition as such. His test, and others now available, are given below.

Ballard's 'Construction' Test.—Fourteen graded passages, each to be rearranged. One hour required. Norms for years 10–14.

Burt's Test.—‘Median Samples’ of children’s compositions, from age 7 to 14 years inclusive. Material in *Mental and Scholastic Tests*, p. 395.

Northamptonshire Composition Scale (G. P. Williams).—A series of median samples. Obtainable Messrs. G. G. Harrap & Co.

(e) *Knowledge of Literature and Classical Speech Enrichments*

Midland Test 5 (Cattell).—This test is intended primarily for purposes of vocational guidance for determining especial interest in, or familiarity with, literature, in younger children. Time required, 15 minutes. To be read silently by subjects.

Items

1. Robinson Crusoe is about a man on a(n) { Aeroplane.
Submarine.
Island.
2. "Oh, what big ears you've got" was said in { The Sleeping Beauty.
Little Red Riding Hood.
Jack and the Bean Stalk.
3. "Peter Pan" is a story about a { wouldn't grow up
little boy who { ate a lot of pancakes.
kept a pet lion.
4. The Pied Piper played his { Kings and Courtiers.
tunes to { Rats and Children.
The Queen of the Fairies.
5. Scrooge comes in a tale called { A Christmas Carol.
King Midas.
Ghosts.
6. Shakespeare wrote a play { The Tempest.
called { She Stoops to Conquer.
Spears and Swords.
7. Samson was { a strong man
a king } described in
the { New Testament.
Old Testament.
Tempest.
8. "Treasure Island" was written by { Kipling.
Dickens.
Stevenson.

9. "Alice in Wonderland" was written by {
 - Angela Brazil.
 - Stevenson.
 - Lewis Carroll.
10. "Westward Ho!" is a story about {
 - Hereward the Wake.
 - The Spanish Main.
 - Christopher Columbus.
11. Write the number of the Proverb against the sentence that explains it:
 1. Birds of a feather flock together.
 2. One swallow does not make a summer.
 3. Beware of buying a pig in a poke.

Don't be misled by insufficient evidence.
 Don't take a thing till you've examined it thoroughly.
 A man is known by the character of his friends.
12. "Ivanhoe" is a story about {
 - Race Horses.
 - Knights.
 - Pirates.
13. The Stories of Sherlock Holmes were written by {
 - Edgar Wallace.
 - Conan Doyle.
 - Rider Haggard.
14. Choose an author responsible for each of the following quotations, and put the number of the quotation at the end of his name:
 - (a) "Of all beasts he learned the language, learned their names and all their secrets." Burns.
 - (b) "Scots, wha hae wi' Wallace bled." Macaulay.
 - (c) "But I have felt a presence that disturbs me with the joy of elevated thought." Wordsworth.
 - (d) "Then out spake brave Horatius." Longfellow.
15. "The Elephant's Child" is described in {
 - Just-so Stories.
 - The Heroes.
 - Memories of a Lion Hunter.
16. "The Everlasting Mercy" was written by {
 - Conan Doyle.
 - Ibsen.
 - Masefield.

17. "The Forsyte Saga" was written by { Walpole.
Synge
Galsworthy.
18. "The Time Machine" is a story by { Jules Verne.
H. G. Wells.
Bernard Shaw.
19. "Man and Superman," was written { Carlyle.
by G. B. Shaw.
Oscar Wilde.
20. Emerson is famous for his { plays.
poems.
essays.
novels.
21. Choose an author responsible for each of the following quotations, and put the number of the quotation at the end of his name:
- (a) "If I should die, think only this of me." Tennyson.
- (b) "My heart aches and a drowsy numbness steals." Hood.
- (c) "I come from haunts of coot and hern." Brooke.
- (d) "I remember, I remember, the fir trees dark and high." Keats.
22. Put these characters in their right plays or stories by writing the number of the appropriate play after them:
- | | |
|---------------------------|-----------------------|
| 1. Macbeth | Orlando |
| 2. The Spectator Club | Mr. Micawber |
| 3. The Rivals | Banquo |
| 4. As You Like It | Sir Roger de Coverley |
| 5. David Copperfield | Bassanio |
| 6. The Merchant of Venice | Dugald Dalgetty |
| 7. A Legend of Montrose | Mrs. Malaprop |
23. Write the number (1, 2, 3, 4) of the expression against the words that explain it.

- | | | |
|--|-----------|---|
| (a) More honoured in the
breach than in the
observance | } means { | Do as you please. |
| (b) Vice versa | | The other way about.
Other things chang-
ing appropriately. |
| (c) Mutatis mutandis | | |
| (d) Laissez faire | | |

24. Choose an author responsible for each of the following quotations, and put the number of the quotation at the end of his name:

- | | |
|---|------------|
| (a) "This they all with a joyful mind
bear through life like a torch in
flame." | Browning. |
| (b) In Xanadu did Kubla Khan, a stately
pleasure dome decree. | Newbolt. |
| (c) "Oh, to be in England, now that
April's there." | Shelley. |
| (d) "The warm sun is failing, the bleak
wind is wailing." | Coleridge. |

25. Write the number of the expression against the words that explain it:

- | | |
|-----------------------|--|
| (a) A pyrrhic victory | } A tale of woe.
Something gained at immense
loss. |
| (b) A jeremiad | |
| (c) A metonym | } A figure of speech
A metrical form in poetry. |
| (d) An iambic foot | |

26. To what object, living or dead, does each of the following passages refer?

"He clasps the crag with crooked hands,
Close to the sun in lonely lands,
Ringed with the azure world he stands.
The wrinkled sea beneath him crawls,
He watches from his mountain walls
And like a thunderbolt he falls."

A(n).....

“ Like a glow-worm golden in a dell of dew.”

A(n).....

“ This royal throne of kings; this sceptred isle.”

The

Scoring.—1 mark for each correct sentence; 3 marks (1 for each item) in questions 11 and 26; 4 marks (1 for each item) in questions 14, 21, 23, 24; 7 marks (1 for each) in question 22.

Norms

Attainment age	•	6½	7	8	9	10	11	12	13	14
Score	•	20	24	50	80	110	160	199	230	265

Diagnostic Tests of Reading Disability.

Monroe, *Diagnostic Reading Tests*. Record Blanks, Manual, and Material. Obtainable from Messrs. Stoelting.

Gray's *Oral Reading Paragraphs* (Mixed Aspects assessed). Obtainable from Public School Publishing Co., Bloomington, U.S.A.

ARITHMETIC

The most common and the most useful division of arithmetical ability is into knowledge of arithmetical methods on the one hand and actual speed and accuracy—‘skill’—in the four fundamental processes, on the other. For performance in these two branches may be at entirely different levels. A university student, for example, may be at an extremely high level in acquaintance with methods, yet below the level of a ‘special’ class child in sheer speed and accuracy of addition, multiplication, etc. In vocational guidance quite different lines of work may be indicated according to the relative proficiency shown in these distinct aspects of mathematical ability.

In diagnosing the causes of backwardness in arithmetic, however, this division is not enough, though it provides a useful preliminary analysis. As is well known to the psychologist who works in the educational field, backwardness in arithmetic, more than in any other subject, is

liable to arise through the child having missed one small process in the sequence of his arithmetical education. The recovery of the necessary link is essential to rectifying the general backwardness. It may be he has never reached proficiency with a certain range of multiplication tables, or has never understood long division, or has an erroneous habit in cancelling fractions. The psychologist must proceed like the geologist to examine the strata until he detects the 'faulty lie' which indicates a missing layer.

For this purpose a qualitative analysis of the errors in a well-graded methodology test is usually sufficient to lead up to the specially devised testing sums with which the psychologist must eventually probe in such cases.

(a) '*Knowledge of Method*' Tests

Burt's Test (1) *Mental*. (Individual.) Ages 4-14.—Ten questions to each year (5 mechanical, 5 problems in each year). Soundly standardised for London children.

(2) *Written* (Group or Individual.)—Ages 7-14. Five questions to each year. *Mental and Scholastic Tests*, p. 363.

Ballard's Test. (Arithmetical Reasoning.) (*New Examiner*, p. 193.)—100 graded questions. Time required, 1 hour.

Midland Test (*Cattell*). (Individual or Group.) Oral or Written.—In either method paper is provided on which rough calculations can be made. The questions are graded and arranged in the order most commonly found in primary school work. Time allowed, 1 hour.

Scoring.—1 mark for each correct answer (total 186).

Norms

Attainment age	6½	7	8	9	10	11	12	13	14
Score .	31	40	93	150	210	270	331	392	460

Items

4 *Years.* (Basic level, before any questions at all are answered.)

- | | | |
|--|---|--|
| Add $\frac{1}{3}$ of a year per question answered. | { | 1. How many fingers am I holding up? (hold up 3).
2. How far can you count? (pass if counts up to 5).
3. If you had 2 pennies in this hand, and I gave you one more, how many would you have then? |
|--|---|--|

5 *Years.* (Level attained when the above three questions are correctly answered.)

- | | | |
|--|---|---|
| Add $\frac{1}{3}$ of a year per question answered. | { | 4. I had 3 potatoes on my plate and my mother gave me two more; how many had I then?
5. I had 5 rabbits, 1 died; how many have I left?
6. Tom had 9 oranges. He gave 4 to Jane. How many has he left? |
|--|---|---|

6 *Years*

- | | | |
|--|---|--|
| Add $\frac{1}{3}$ of a year per question answered. | { | 7. What are twice 3?
8. How many do 6 and 5 make?
9. 9 apples were divided equally among 3 children. How many did each have? |
|--|---|--|

7 *Years.*

- | | | |
|--|---|--|
| Add $\frac{1}{4}$ of a year per question answered. | { | 10. I had seventeen apples and lost eight. How many are left?
11. How many halfpennies are there in fivepence?
12. My brother has ten nuts, my sister has thirteen, and I have eight. How many have we got together?
13. I have thirty apples. If they are divided equally among five boys, how many will each get? |
|--|---|--|

8 Years begin here.

Add $\frac{1}{6}$ of a
year per
question
answered.

- 14. How many days are there in six weeks ?
- 15. Milton is 23 miles away; a man gave me a lift in his car for 15 miles. How many miles have I still to walk ?
- 16. My brother is five feet high. How many inches is that ?
- 17. What do 25 and 26 make ?
- 18. What number is half-way between 11 and 17 ?
- 19. There were 104 sailors and only 8 could go in one boat. How many boats would be wanted ?

9 Years.

Add $\frac{1}{6}$ of a
year per
question
answered.

- 20. John had 14 coupons. He lost 8, but his mother gave him 11 more. How many had he then ?
- 21. In my pocket are six halfpennies, three pennies, and half-a-crown. How much is that altogether ?
- 22. What are nine eights ?
- 23. How many ounces are there in one and a half pounds ?
- 24. 16 companies of soldiers marched to the fort (there were 250 in each company). 7 men were killed on the march. How many arrived ?
- 25. How many thirteens are there in 65 ?

10 Years. (Henceforth add fractions of a year for each question in the manner indicated above.)

- 26. A hunter shot 47 lions in one year, 123 in the next, and 196 in the next. How many did he shoot altogether ?
- 27. An airman rose 1,000 feet in the air, fell 63, rose 111, and fell 254. What is his present height ?
- 28. Captain Scott was born in 1868 and died at the South Pole in 1912. How old was he when he died ?

29. I buy 8 penny stamps and 9 halfpenny ones. How much change shall I have from 2 shillings?
30. How many minutes are there in 3 hours?
31. The airman had to be in his machine a quarter of an hour before the flight started. The flight started at five-and-twenty to one. When had he to be in his machine?

11 *Years.*

32. If apples are seven for sixpence, how many could I buy for half-a-crown?
33. How many inches in 3 yards 1 foot?
34. A boxer weighed 10 stone 3 pounds, but he lost five pounds while training. What is his weight now?
35. A boxer had £2 given him as a prize. With this he bought a book for 7s. 6d., and six tennis balls at tenpence each.
How much had he left?
36. How much is a quarter of £5 10s.?
37. How many separate triangles can I make with 25 matches, and how many matches will be left over?

12 *Years.*

38. What is $\frac{4}{21} \div \frac{8}{7}$?
39. How much do $\frac{1}{5}$ and $\frac{2}{3}$ make?
40. What is $\frac{2}{5}$ of $2\frac{1}{4}$?
41. What is $\frac{1}{3}$ of $\frac{1}{4}$?

13 *Years.*

42. A man earned £131 3s. 10d. a year in wages. How much is that a week? (52 weeks in a year.)
43. My car uses a pint of oil every 100 miles. How many miles can I go with two gallons of oil?
44. How much is left if you take $\frac{1}{3}$ from $1\frac{1}{4}$?

14 *Years.*

45. In one case of apples 6 out of every 50 were bad, and in another case 4 out of 40 were bad. Which case contains the greater proportion of good apples?

46. What is $1\frac{5}{9} \times 1\frac{10}{3}$?
47. What is the shortest length of ribbon from which I can cut off either 4-inch, 6-inch, or 8-inch lengths an exact number of times?
48. What is six times $1\cdot31$?
49. A boy sold a knife for 1s. 3d., gaining 3d. on what he gave for it. What fraction of the cost price was his profit?

KEY TO ARITHMETIC TEST

1	3	13	6	25	5	37	8 triangles 1
2	5	14	42	26	366	38	$\frac{1}{6}$ [over
3	3	15	8 miles	27	794	39	$\frac{1}{4}$
4	5	16	60 ins	28	44 yrs	40	$\frac{1}{10}$
5	4	17	51	29	$11\frac{1}{2}d$	41	$\frac{1}{12}$
6	5	18	14	30	180 mins	42	$\pounds 2$ 10s $5\frac{1}{2}d$
7	6	19	13	31	12 20	43	1,600
8	11	20	17	32	35	44	$\frac{1}{12}$
9	3	21	3s	33	120	45	2nd Case
10	9	22	72	34	9 st. 12 lb	46	2
11	10	23	24 oz.	35	$\pounds 1$ 7s 6d	47	2 lb
12	31	24	3,993	36	$\pounds 1$ 7s 6d	48	7 86
						49	$\frac{1}{2}$

Northumberland Standardised Tests. (1925 Series.) (Burt.)

I. Arithmetic. (Group or Individual.) 49 minutes. Ages 7-14 years.—Test has seven sub-tests, each of which admits of separate assessment by its own norm table. They are: (1) Addition (speed and accuracy, but also knowledge of method in most compound systems); (2) Subtraction (speed, accuracy, and knowledge of methods as (1)); (3) Multiplication (speed, accuracy, and method knowledge); (4) Division; (5) Mental arithmetic; (6) Rules (knowledge); (7) Reasoning (knowledge of method, plus speed, skill, and intelligence). Norms also for test as a whole. Soundly standardised. Manual of Instructions with Norms for group testing obtainable from University of London Press, Ltd.

(b) *Mechanical Skill*

Burt's Tests. 1. *Mechanical Graded Test.*—This avoids 'problems,' but is to a large extent also a measure of 'method knowledge' rather than of speed and accuracy. Five items for each year from 7 to 14.

2. *Ungraded Test*.—A continuous test for each of the four rules—addition, subtraction, etc. Five minutes allowed for each paper. Score by number of correct figures.

Ballard's Test. (*New Examiner*, p. 190.)—A graded test similar to Burt's above, avoiding problems, but testing knowledge of method in addition to mechanical speed and accuracy. 100 items. Time allowed, 50 minutes. Also (p. 147) 1 minute oral addition test, 1 minute subtraction test. Norms for 5–12 years.

Midland Test (Cattell). (Group or Individual.)—Testing speed and accuracy in the four rules. To avoid fatigue and for greater reliability of measurement, each section (adding, etc.) is in two parts, i.e. eight parts in all. Exactly 1 minute is allowed on each part.

Scoring.— $\frac{1}{2}$ mark for each figure correct. Score from all parts included in one total.

Norms

Attainment age	6 $\frac{1}{2}$	7	8	9	10	11	12	13	14
Score	11	30	128	215	309	400	500	584	657

Material

1. *Addition*.

95	74	63	76
56	29	79	31
18	86	32	39
<u>37</u>	<u>32</u>	<u>45</u>	<u>46</u>

2. *Subtraction*.

7385	8435	9254	5106	4871	3598
<u>6244</u>	<u>6317</u>	<u>5617</u>	<u>3967</u>	<u>2904</u>	<u>2719</u>

3. *Multiplication*.

1713	2435	2302	5941	4586	7664
<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>

4. *Division*.

2)14524	3)17814	4)33700	5)16420	6)31728	7)52052
---------	---------	---------	---------	---------	---------

5. *Addition.*

95	59	39	46	93	28
63	28	63	47	23	41
39	45	58	12	72	93
<u>42</u>	<u>79</u>	<u>77</u>	<u>24</u>	<u>49</u>	<u>64</u>

6. *Subtraction.*

9844	9263	7431	6057	3056	5641
<u>9578</u>	<u>2325</u>	<u>6914</u>	<u>2884</u>	<u>2217</u>	<u>3172</u>

7. *Multiplication.*

8679	5878	7049	2093	4136	7120
<u>8</u>	<u>9</u>	<u>3</u>	<u>5</u>	<u>7</u>	<u>9</u>

8. *Division.*

8) 46624 9) 84033 2) 18752 4) 92504 6) 31782 8) 50072

Williams's Junior Scholarship Tests. II. Arithmetic : (a) General; (b) Speed and accuracy. Obtainable from Messrs. G. Harrap & Co.

Achievement Test in Other Subjects.—The remaining subjects, i.e. other than English and Arithmetic, follow in alphabetical order.

(B) *Other Accomplishments and Skills**Algebra*

Ballard's Test. (*New Examiner*, p. 200.)—100 items, graded. Time, 2 hours. Norms (for Central School boys from 11 to 14 years) for 1-4 years of Algebra study.

Douglas's Diagnostic Tests for Elementary Algebra.—See H. R. Douglas, "A Series of Standardised Diagnostic Tests in the Fundamentals of Elementary Algebra," *J. Educ. Res.*, 1921, p. 396.

Institute of Educational Research Algebra Test.—Form A, Elementary, to Quadratics. Form B, Quadratics and beyond. Bureau of Publications, Columbia University, N.Y.

Biology

Richards's Achievement Test in Biology. (Dr. Richards's Biology Department, Clarke University.)—Based on extensive preliminary questionnaire investigation as to biology courses. Suitable for higher secondary schools and intermediate university students. Multiple response. Stencil key. Sound norms. Obtainable: Messrs. Stoelting.

Drawing

The measurement of drawing ability is one frequently made in the course of clinical examination of children, because it throws valuable light on the emotional and ideational make-up of the child; it requires little time; it is interesting to the child, and the observation of his method of approach and ultimate product offer evidence as to his general maturity.

Burt's Test is by far the most commonly used. The child is asked simply to 'draw a man.' No time limit is set. The finished product is compared with the members of the following series¹ of median samples (see p. 78 as to meaning of median sample) and allotted to the appropriate year. For valuable detailed notes on qualitative interpretations of drawings see Burt's *Mental and Scholastic Tests*, pp. 318-25.

An attainment scale for adults is reproduced on p. 55 of the chapter on "Special Aptitudes."

Economics

American Council Economics Test.—Secondary school and university

Electrical Inclination Test.—A test of information and interest in practical electrical problems. Messrs. Stoelting.

French

American Council Alpha French Test 1926.—Range: Secondary school and college. Available from World Book Co., Yonkers, N.Y.

American Council Beta French Test.—Range: Junior school and secondary school. World Book Co., Yonkers, N.Y.

¹ Reproduced here by kind permission of Professor Burt.

French Aural Comprehension Test.—Available from Bureau of Publications, Columbia University, N.Y.

General Knowledge

(1) *For Children.*

“*Northampton Group Intelligence Test.*” (G. Perrie Williams.)—A test of general knowledge (geography, history, literature, general science, everyday observation) for children of 11–14 years. Time, 35 minutes. Norms as yet limited to medians on each sub-test for 11–12 years. Messrs. G. Harrap & Co.

Probst's Kindergarten Test.—Two forms, each of 32 questions (time, number, simple mechanics), correlation ‘g’ .64; consistency, .94; rough norms. See “A General Information Test for Kindergarten Children,” *Child Development*, 1931, ii, 81.

(2) *For Older Children and Adults.*

A test of general knowledge, including mechanical and constructional dress-making, scientific and mathematical, business and financial, artistic and musical, rural and farming, furnishing, literary, sport, geographical, social, philosophical, and religious knowledge is provided by the Interest Tests on p. 121 of chapter IV. Use only sections 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 14, 15. The total time is rather less than half an hour. Each section is timed separately as indicated on p. 141. The subject's relative familiarity with each branch can be determined separately, but his score on the whole can also be assessed by the norms below.

Norms.

For 14-year-old children (based on 250 cases):

<i>Decile</i>	1	2	3	4	5	6	7	8	9	10
Raw Score	Below 21	5 29	5 34	5 39	1 42	5 47	5 52	5 58	5 66	Above 66

For Adults.—No results for average adults available. These are from student groups (University and W.E.A.):

<i>Decile</i>	1	2	3	4	5	6	7	8	9	10
Raw Score	Below 38	5 44	5 49	5 54	5 59	5 65	5 71	5 79	5 88	Above 88

Whipple's Range of Information Tests.—Suitable for adults. 100 words. Blanks obtainable Messrs. Stoelting.

Geography

Ballard's Test. (*Op. cit.*, p. 211.) 100 items. Time, 45 minutes. Largely the geography of England and Wales, but including questions on physical and economic geography. Norms (incomplete) according to year of study.

Northumberland Standardised Tests. (Geography.)—See p. 103.

German

American Council Alpha German Test. Vocabulary. Secondary school and college. World Book Co., Yonkers, N.Y.

Geometry

See J. H. Minnich. (*Minnich's Geometry Tests*), "A Scale of Measuring Pupils' Ability to Demonstrate Geometrical Theorems," *School Review*, 1919, p. 101.

Handwriting

Ayres Handwriting Scale :

(1) Primary schools.

(2) Adults.

Available from Russell Sage Foundation, New York.

Ballard's Script-writing Norms. For children. A series of steps, arbitrarily chosen, with four specimens at each step for comparison. Available in *New Examiner*.

Burt's Test of Goodness of Cursive Handwriting.—Median samples for each age, from 5 to 14 years inclusive. *Mental and Scholastic Tests*, p. 371.

Courtis's Standard Research Tests in Handwriting.—Senior departments of primary schools. Obtainable from S. A. Courtis, Detroit.

Freeman Chart for Diagnosing Faults in Handwriting.—All standards of primary schools. Houghton Mifflin Co., Boston.

AGE 14



FIG 41

Midland Test (Cattell).—The following scale in cursive style, on the median samples' principle, is intended for use with school-leavers of 13–15 years. It is graded only into five stages, since finer grading is not wanted and wastes time in most vocational guidance work. The steps are on an 'equal unit intervals' basis, i.e. the sections of the normal distribution, of which each is a typical sample, are in the proportions 1 : 4 : 6 : 4 : 1. These norms are from 200 elementary school children of 14 years. Two boys' and two girls' samples are given in each section. This may be regarded as a continuation of Burt's Scale above.

See Figs. 42–6, pp. 110–14.

History

Ballard's Test. (*Op. cit.*, p. 224.)—History of England since accession of Henry VII. 100 items. Time, 45 minutes.

Columbia Research Bureau American History Test.—Secondary school and university. World Book Co., Yonkers, N.Y.

Northumberland Standardised Tests (History).—See p. 85.

Van Wageningen's History Scales.—See "Historical Information and Judgment in Pupils of Elementary Schools," *Columbia Contrib. Educ.*, No. 101, 1919.

American Council European History Test.—Secondary school and university. World Book Co., Yonkers, N.Y.

Italian

American Council Tests in Italian.—Secondary school and college. World Book Co., Yonkers, N.Y.

Latin

Henmon's Latin Tests.—See "The Measurement of Ability in Latin," *J. Educ. Psychol.*, 1917, pp. 515, 588; 1920, p. 121.

<i>Co-operative Junior Latin Test</i>	} Available from Co-operative Test Service, New York.
<i>Co-operative Senior Latin Test</i>	

Powers Diagnostic Latin Test.—First-year Latin. Avail-

People who live glass house should
not throw stones" said Alice to
the Mock Turtle

"People who live in glass houses
shouldn't throw stones," said Alice to
the Mock Turtle.

"People who live in glass houses
shouldn't throw stones" said Alice
to the Mock Turtle

"People who live in glass houses shouldn't
throw stones" said Alice to the Mock Turtle

FIG. 42 —GRADE I.

On this and subsequent pages the specimens of handwriting by boys are at the top and by the girls underneath.

"People who live in glass houses shouldn't
throw stones," said Alice to the Mock
Turtle

"People who live in glass houses shouldn't
throw stones" said Alice to the Mock
Turtle

"People who live in glass houses
shouldn't throw stones," said Alice
to the Mock Turtle

"People who live in glass houses
shouldn't throw stones" said Alice
to the Mock Turtle

"People who live in glass houses should not throw stones," said Alice to the Mock Turtle

"People who live in glass houses shouldn't throw stones," said Alice to the Mock Turtle.

"People who live in glass houses shouldn't throw stones," said Alice to the Mock Turtle

"People who live in glass houses shouldn't throw stones," said Alice to the Mock Turtle

FIG. 44.—GRADE III.

"People who live in glass houses
should not throw stones"
said Alice to the Mock Turtle

"People who live in glass houses
should not throw stones," said Alice
to the Mock Turtle.

"People who live in glass houses shouldn't
throw stones" said Alice to the
Mock Turtle

"People who live in glass houses shouldn't
throw stones," said Alice to the Mock
Turtle

"People who live in glass houses should not throw stones," said Alice to the Mock Turtle

"People who live in glass houses should not throw", stones said Alice to the Mock Turtle

"People who live in glass houses shouldn't throw stones," said Alice to the Mock Turtle

"People who live in glass houses shouldn't throw stones," said Alice to the Mock Turtle

FIG. 46.—GRADE V.

able from Public School Publishing Co., Bloomington, U.S.A.

Mathematics

See also Arithmetic, Algebra, Geometry, Trigonometry.

Rogers and Thurstone's Tests of Mathematical Achievement.—N.Y., U.S.A.

Mechanical Knowledge

Stenquist's Mechanical 'Aptitude' Tests. Senior I and Senior II.—A paper test with pictures to test information with regard to tools and machines. Stoelting or World Book Co., Yonkers, N.Y.

Stenquist's Assembly Test. Series I and Series II (of practically equal difficulty).—Each has ten common mechanical objects which are to be assembled. May be regarded as a measure of attainment in skill in handling mechanical objects. Scored on errors and successes in a given time. Norms for ages 11-14 for adults. Obtainable from Messrs. Stoelting. Revised form available from the National Institute of Industrial Psychology.

Knowledge of Tools Test. (Warnes.)—Paper Test. Appropriate norms for technical schools. Obtainable from Messrs Stoelting.

Religious Knowledge

Laycock's Test of Biblical Information for children over 11 and adults.—Seven sub-tests giving 100 items. Carefully worked out and widely standardised for Canadian children. Obtainable from University of Alberta Bookstore, Edmonton, Canada.

Science

Caldwell's Science Tests. (Botany, Chemistry, Zoology, and Physics.)—Secondary school. Obtainable: General Board of Education, New York.

A Test of Scientific Aptitude. (*J. Educ. Psychol.*, vol. 18, p. 27.) (D. L. Zyne.)—Recorded by author as an aptitude test, but probably attainment (in habits).

Co-operative General Science Test.—Secondary schools and university entrants. Co-operative Test Service, New York.

Spanish

American Council Alpha Spanish Test.—Secondary school and university.

American Council Beta Spanish Test.—Preparatory and secondary school, 1926.

Sports

Information Test. (Rogers.)—Messrs. Stoelting.

Stenography and Typing

Stenographic and Typing Test. (Rogers.)—Dictation and typing tests. See Link, *Employment Psychology*, Macmillan. Messrs. Stoelting.

Trigonometry

American Council Trigonometry Test.—Secondary school and University. World Book Co., Yonkers, N.Y.

CHAPTER IV

GAUGES OF INTEREST, ATTITUDE, AND OBJECT LIBIDO INVESTMENT

1. Importance of Interest Tests

THE psychoanalytic method of 'free association' is the most widely used technique for exploring interests and emotional attachments, particularly with regard to those deeper currents of interest not realised and recognised by the conscious mind.

In circumstances where the free association technique is not possible, or, more commonly, as a brief preliminary survey to guide such proceedings, an objective interest test of a more systematic kind is highly valuable; indeed, I have known instances where the inference from the objective test has in the end proved to be more correct than the first psychoanalytic interpretations. Frequently, with children, an all-round assessment of interests, revealing in which directions these are abnormally strong or strikingly deficient, gives at once, along with an investigation of the home situation, a clue to the main causes of maladjustment. With adults, such a gauge of interests may be a measure only of the outer crust of the mind—of the object libido attachments—and may not be fine enough to detect narrow intensive concentrations even there. But in giving an objective picture of the adjustments at the conscious level—free from the bias of the analyst's own conception of those interests (which is often based on insufficient evidence)—the test result is a valuable contribution to the jig-saw puzzle of the personality picture.

Secondly, interest tests have considerable use in vocational guidance. It is true that about 50 per cent. of 14-year-old children change their conceptions as to what is the most desirable and interesting profession at least once within a bare twelve months; but this does not imply that

their basic interests—mechanical, social, out-of-door—change with the same rapidity, and recent research¹ has shown that vocational guidance, based on the interest investments already made at that age, turns out to be as reliable as that based on test estimates of ability. Obviously both need to be taken into account in a systematic and intelligent synthesis.

In social psychology important deductions may be made from the application of scientifically standardised gauges of interest and attitude to whole groups and classes of people.

Interest and attitude tests are probably of greatest value to the psychologist, however, in the investigation of character and personality adjustment. For this reason there are difficulties in drawing the line between tests which should appear in the present chapter and those which appear under character and temperament. Our division rests on this basis: that interest and attitude tests gauge the person's conscious likes and dislikes, attitudes, opinions, and beliefs with regard to particular objects, whereas tests of temperament, character, and disposition in those respects in which they approach attitude tests, are measuring the general attitude to life as a whole. For example, Allport's Ascendancy-Submission Test is classed as a test of disposition because it concerns attitude to life as a whole, whereas a gauge of superiority-inferiority towards, say, foreigners or women, would be regarded as an attitude test.

Obviously, even with this restriction, interest and attitude tests have great importance for personality, since, as McDougall has cogently shown, the particular investments of a person's instinct energy—his conscious sentiment structure (other than the self-regarding sentiment)—are a considerable part of his character. When we have mapped the individual's sentiments, we have gone a long way towards predicting his behaviour and towards understanding problems in the distribution of his energies.

¹ McHale ("An Information Test of Interest," *Psychol Clinic*, 1930, xix) found high correlation between results on an interest test and efficiency in line of work eventually followed

In clinical work, particularly, a quantitative investigation of the field of conscious interests should be a basis for excursions into the unconscious and a check on the results.

2. Types of Test Employed

Since the whole subject is still in a chaotic state, largely through excessive practical applications having preceded serious research into sentiment structure, it is not surprising that the attempts to approach the matter vary enormously.

In America, particularly, measures of all manner of interests and attitudes—vocational interests, attitudes to various religions, to foreigners, to prohibition, to political parties, to birth control, free trade, to sex questions, Sunday observance, towards war, etc.—have been developed and standardised.¹

Unfortunately, the majority make a very naïve, direct approach, asking the subject to rate himself on a scale, to state his preferences or underline his interests. With equal *naïveté* they have fallen foul of the danger of importing moral approval and disapproval into the question. Thus there are several tests of “Racial *Prejudice*.” Ethical implications of this kind are proper to the technique of political propaganda, but are ridiculous in psychology; for it behoves the psychologist to preserve complete scientific detachment from the natural phenomena which he studies; indeed, ‘prejudice’ in the psychologist amounts to a complete betrayal and disqualification of his science. It is not for the psychologist as such to decide whether the attitude is sound. Apart from such implications in labelling tests, the measurement of attitude itself proves to be surprisingly free from effects due to the attitude of the designer himself.²

The failure to devise sufficiently ingenious indirect approaches which would measure the subject’s interests or attitudes without his being aware of the fact is more serious. Experiment has shown that, as one would expect, subjects

¹ For a complete list of such standardised scales see G. Hildreth, *A Bibliography of Mental Tests and Rating Scales*, p. 165. Also the end of the present chapter.

² E. D. Hinckley, “The Influence of Individual Opinion on Construction of an Attitude Scale,” *J. Soc. Psychol.*, 1932, III.

consciously or unconsciously (1) give themselves flattering scores, and (2) in general give themselves less extreme scores than would result from the common opinion of their fellows.¹ Fundamentally honest persons may exist, but they are not very prevalent among persons seen by the practising psychologist. For research purposes, with groups of students having scientific consciences, such tests may temporarily be admitted, but even then the psychologist must face the reproach that he is not basing his conclusions on typical samples of human nature.

All this applies *a fortiori* to measures of temperament and emotional make-up based on the same direct self-revelation in questionnaires (see Chap. VI).

Those who are interested in such tests for research purposes or for the limited objects for which they are suitable, e.g. group differentiation, are referred to the extensive literature on their use and improvement.²

The three approaches which seem to be more promising than the above are: (i) use of the psychogalvanometer; (ii) observations of the selective action of attention and memory on material presented³; (iii) measurements of the individual's general knowledge, of the stores of information that have been accumulated around his particular interests. No standardised tests are available in (i) and (ii). McCrae⁴ used the magnitude of the psychogalvanic reflex, when various instinct situations were presented to subjects, as a fairly successful measure of instinct strength. There is little doubt that, when the technique is correct,⁵ the magnitude of the deflection is related to the conative strength of the interest aroused by the exposed object.

¹ C. W. Manger, "The Effect of Self-interest on Scores made on the Allport Test for Measuring Ascendancy Submission," *Psychol. Clinic*, 1932, xxi.

² D. D. Droba, "Methods for Measuring Attitudes," *Psychol. Bull.*, 1932, xxix; D. Fryer, "Validating Measures of Interest," *Personnel J.*, 1932, xi; C. K. G. Wang, "Suggested Criteria for Writing Attitude Statements," *J. Soc. Psychol.*, 1932.

³ E.g. Moore, in "Testing the Strength of Instincts," *Amer. J. Psychol.*, where stimulus words, e.g. many, career, achievement, are exposed, and the subject's quickness of response with an appropriate word is taken as a measure of the strength of that instinct.

⁴ Colman and McCrae, "Measuring the Strength of Instincts," *Forum Educ.*, 1928.

⁵ See suggestion in R. B. Cattell, "Experiments on the Psychical Correlate of the Psychogalvanic Reflex," *Brit. J. Psychol.*, xix, 4, 1929.

In measuring interest by the third method, the subject is presented with an objective (new type) achievement test which he believes to be a test of information and memory. The assumption behind the test is that a person is well informed in those subjects in which he has long had powerful, stable interests, and ill-informed in subjects which don't interest him. Occasionally, for examination purposes or because of the interests of friends, he will acquire information in subjects which would not otherwise have interested him, but the accessibility of his knowledge on those subjects will decline rapidly with time unless true interest appears. Much research is needed into methods (i), (ii), and (iii). The present writer obtains correlations of 0.4 to 0.5 between measurements of interests by the attention method (spontaneous attention to pictures) and the information method.¹

3. Test Material Available

Interest Test A.15 (First form of test, 15 sections)

This may be called a "Gauge of Object Libido Attachment," since in measuring interests we must bear in mind that we are in fact exploring the objective investments of libido, which should throw light on the libido investments generally.

It is divided into fifteen sections, this division having been found suitable by preliminary research. For a discussion of the rationale of this division, see p. 143. Here it is sufficient to state that all attempts to classify interest are bound to be arbitrary, and that the plan adopted here is psychological rather than logical and philosophical. It is a classification based on some of the main types of interest actually found in clinical work, and is intended to be most useful from the point of view of the significance of interests in individual adjustment.

The items in each section are roughly graded in order of increasing difficulty, and the time allowed is so chosen that only those who can answer each question instantly will succeed in doing all items. In some sections, notably that

¹ See *Journal of Character and Personality*, Jan 1936.

on sex interests, the sampling of knowledge has to be through indirect associations, and the extent of knowledge is discovered rather by questioning on unusual aspects than by a direct intensive survey. For instructions and norms see end of test.

I. Travelling, Holidaying, Geographical Interests

Dykes are very common in { Italy.
Holland.
Assam.
Canada.

Dr. Livingstone crossed { Australia
Africa } and met Stanley.

The Straits of Magellan run by { Sicily.
S. America.
Iceland.
Ireland.

Which of these holiday resorts is on the sea coast ? { Buxton.
Paignton.
Bath.
Llangollen.

Which of the following is given on a passport ? { the colour of your eyes.
the town of your destination.
the names of your parents.
your finger prints.

The one-inch ordnance survey map { has contour lines only every 50
feet (sometimes with colours).
has different colours for different heights.
has contours only at 100 feet intervals (sometimes with colours).
marks steep hills with a special sign.

The " land of the midnight sun " is { Central Africa.
Alaska.
Tierra del Fuego.
Norway.

The express from London to { King's Cross } and
 Birmingham leaves { Paddington }
 goes by { G.W.R. } in about { two } hours.
 { L.M.S. } { four }

Which of the following represent associations { A.A.A.
 concerned with travelling ? { T.U.
 { C.T.C.
 { Y.H.A.

The following are the official annual holidays (for the whole year) allowed to the following people. Put a number to show the holiday which goes to each person:

about {	eight weeks	2	1. Policeman.
	three weeks	3	2. Elementary School Teacher.
	twelve days	1	3. Bank Clerk.
	thirty days	4	4. Lieutenant in the Army.

II. Sporting, Militaristic, and Primitive Masculine Excitements Generally

A try in Rugby football is { kicking the ball over the
 gained by { goal line.
 { carrying the ball over the
 { goal line.
 { throwing the ball over the
 { goal-keeper's head.
 { dribbling the ball into the
 { goal circle.

The first stroke won in a game { 5
 of tennis gives { 10 } points to the striker.
 { 15
 { 12 }

The length of a cricket pitch is { 18
 { 20 } yards.
 { 22
 { 24 }

The Derby comes { before } the Grand National and
 { after }

is $\left\{ \begin{array}{c} \text{before} \\ \text{after} \end{array} \right\}$ the Cesarewitch.

The Annual Race at the Isle of Man is $\left\{ \begin{array}{l} \text{Tourist Trophy.} \\ \text{Schneider Cup.} \\ \text{Le Mans.} \\ \text{Duke of York's} \\ \text{Cup.} \end{array} \right.$
for $\left\{ \begin{array}{c} \text{motor-cycles} \\ \text{motor-cars} \end{array} \right\}$ and is known as the

A Lewis Gun fires $\left\{ \begin{array}{l} \text{small shells.} \\ \text{shells from a moving belt.} \\ \text{bullets from a rotating drum.} \\ \text{grenades.} \end{array} \right.$

A small-bore shot-gun for shooting rooks $\left\{ \begin{array}{l} \text{Two two.} \\ \text{Winchester.} \\ \text{Four ten.} \\ \text{Twelve Bore.} \end{array} \right.$
is known as

The Grand National is a $\left\{ \begin{array}{l} \text{flat race.} \\ \text{hurdle race.} \\ \text{steeplechase.} \\ \text{point to point.} \end{array} \right.$

Grouse shooting begins on $\left\{ \begin{array}{l} \text{September 1st.} \\ \text{October 1st.} \\ \text{August 12th.} \\ \text{July 4th.} \end{array} \right.$

The main control of an aeroplane is $\left\{ \begin{array}{l} \text{joy stick.} \\ \text{aileron.} \\ \text{rudder wheel.} \\ \text{dip rod.} \end{array} \right.$
called a(n)

III. Business, Commercial, Acquisitive Interests

A penny is $\left\{ \begin{array}{c} \text{bigger} \\ \text{smaller} \end{array} \right\}$ than a two-shilling piece. A pound
note is $\left\{ \begin{array}{c} \text{greener} \\ \text{brownier} \end{array} \right\}$ than a ten-shilling note.

The rate of interest on money in the P.O. Savings Bank is $\left\{ \begin{array}{l} 2\frac{1}{2}\% \\ 3\frac{1}{2}\% \\ 4\frac{1}{2}\% \\ 5\frac{1}{2}\% \end{array} \right.$

A receipt stamp is required for any amount over $\left\{ \begin{array}{l} \pounds 1 \\ \pounds 2 \\ \pounds 3 \\ \pounds 4 \end{array} \right.$

'Piece Work' is a system of wages in which a man is paid $\left\{ \begin{array}{l} \text{a bonus for overtime.} \\ \text{so much for every hour's work.} \\ \text{so much for every article made.} \end{array} \right.$

An order cheque differs from a bearer cheque in that $\left\{ \begin{array}{l} \text{extra for steady work.} \\ \text{it needs a receipt stamp on the back.} \\ \text{it cannot be paid unless crossed.} \\ \text{it can be paid to anyone only when endorsed.} \\ \text{it can be paid to anyone only when not endorsed.} \end{array} \right.$

The amount of rates a man pays depends on $\left\{ \begin{array}{l} \text{his income.} \\ \text{the rent of his house.} \\ \text{whether he has a car.} \\ \text{his taxes.} \end{array} \right.$

Which of the following $\left\{ \begin{array}{l} \text{is} \\ \text{are} \end{array} \right\}$ taxed in this country? $\left\{ \begin{array}{l} \text{houses.} \\ \text{motor-cycles.} \\ \text{cinema performances.} \\ \text{ginger beer.} \\ \text{letters.} \end{array} \right.$

Put 1, 2, 3, and 4 against these names to show which earns most, next most, etc., and least (at 30 years of age) $\left\{ \begin{array}{l} 4 \text{ Postman.} \\ 3 \text{ Policeman.} \\ 2 \text{ Secondary School Teacher.} \\ 1 \text{ Life Insurance Agent.} \end{array} \right.$

A man who wishes to depress the market is known as a { bull.
contango.
bear.
chequer.

A balance sheet must be signed by a { shareholder.
solicitor.
director.
cashier.
auditor.

IV. Mechanical and Constructional Interests

Fretwork is usually done with { deal.
3-ply wood.
matchboarding.

A spanner is used for { turning screws.
lifting cars.
tightening nuts.
pulling out nails.

The skirt of a thick woollen frock is best the bodice to get a neat effect. { whipped
smocked } to
gathered
pleated

A gudgeon pin is found in the { piston
camshaft
wheel hub } of a motor-car.
tyre

The top rail of a door is fitted by { a mortice tenon.
a haunched mortice.
a stamp tenon.
copper screws.

The bias battery in a wireless set is connected to the { valve.
dial.
aerial.
high-tension circuit.

Stops on a camera regulate the { aperture.
shutter speed.
size of film.
focusing.

'Slip' is used in { photography.
pottery.
etching.
joinery.

Which of these could you best make with $1\frac{1}{2}$ yards of gingham? { Nightdress for mother.
Romper for baby.
Handkerchief satchel.
Handkerchiefs for father.

The 'differential' of a car is found in the { back axle.
gear-box.
steering rod.
engine.

V. Scientific and Mathematical Interests

The column of mercury held up by air pressure is highest { on a mountain.
at sea-level.
in a deep mine.
at the equator.

A planet differs from stars in that it { is larger.
moves in an orbit.
twinkles a lot more.
has rings round it.

In sunlight plants give out { chlorophyll.
air.
carbon dioxide.
oxygen.

Water boils at { 200° Fahrenheit.
100° Fahrenheit.
100° Centigrade.
200° Centigrade.

Limestone is a(n) { igneous
sedimentary } rock and { does
does not } contain fossils.

Mendel discovered a law concerning $\left\{ \begin{array}{l} \text{plant growth.} \\ \underline{\text{heredity.}} \\ \text{natural selection.} \\ \text{photo-synthesis.} \end{array} \right.$

$$a^2 + 2ab + b^2 = \left\{ \begin{array}{l} (a - b)^2 \\ (a + b)^2 \\ \underline{(a - 2b)^2} \\ (a + 2b)^2 \end{array} \right.$$

Underline the element with the largest atomic weight. $\left\{ \begin{array}{l} \text{Iron.} \\ \text{Oxygen.} \\ \underline{\text{Uranium.}} \\ \text{Hydrogen.} \end{array} \right.$

That current = $\frac{\text{voltage}}{\text{resistance}}$ is known as $\left\{ \begin{array}{l} \text{Ampere's law.} \\ \underline{\text{Ohm's law.}} \\ \text{Boyle's law.} \\ \text{Volta's law.} \end{array} \right.$

The speed of sound depends upon $\left\{ \begin{array}{l} \text{the pitch of the note.} \\ \text{the amplitude of vibration.} \\ \underline{\text{the temperature of the air.}} \\ \text{the pressure of the air.} \end{array} \right.$

VI. Things of the Mind : Philosophy ; Logic ; Language ; History

Aristotle was $\left\{ \begin{array}{l} \text{A French writer.} \\ \text{A Greek philosopher.} \\ \underline{\text{An Italian artist.}} \\ \text{An ancient Roman.} \end{array} \right.$

A paradox is a(n) $\left\{ \begin{array}{l} \underline{\text{statement that seems to contradict itself.}} \\ \text{particular kind of metaphor.} \\ \text{earthly story with a heavenly meaning.} \\ \underline{\text{kind of bird.}} \end{array} \right.$

The Act which said that people must not be kept in prison indefinitely without trial was called $\left\{ \begin{array}{l} \text{Magna Charta.} \\ \text{Bill of Rights.} \\ \underline{\text{Habeas Corpus.}} \\ \text{Emancipation Act.} \end{array} \right.$

Mutatis Mutandis means $\left\{ \begin{array}{l} \text{with necessary alterations.} \\ \text{change is for the best.} \\ \text{life is change.} \\ \text{willing or unwilling.} \end{array} \right.$

Utilitarianism is a $\left\{ \begin{array}{l} \text{ethics} \\ \text{economics} \end{array} \right\}$ system of founded by $\left\{ \begin{array}{l} \text{Plato.} \\ \text{Descartes.} \\ \text{Bentham.} \end{array} \right.$

An $\left\{ \begin{array}{ll} \text{Analogy} & 2 \\ \text{Aphorism} & 1 \\ \text{Hyperbole} & 3 \end{array} \right\}$ is a $\left\{ \begin{array}{l} (1) \text{ short statement of a general} \\ \text{truth.} \\ (2) \text{ parallel.} \\ (3) \text{ exaggeration.} \end{array} \right.$

Indicate the meaning of each of the three words by putting the number of the correct meaning against it.

A syllogism is a $\left\{ \begin{array}{l} \text{silly remark.} \\ \text{form in logic.} \\ \text{platitute in philosophy.} \\ \text{logical error.} \end{array} \right.$

Voltaire was to the French Revolution as $\left\{ \begin{array}{l} \text{Lenin} \\ \text{Karl Marx} \\ \text{Trotsky} \\ \text{Rousseau} \end{array} \right\}$ was to the Communist Revolt of Russia.

Solipsism is the belief that $\left\{ \begin{array}{l} \text{a good act is its own reward.} \\ \text{an idea that works in practice is true.} \\ \text{things exist only as ideas in the minds of} \\ \text{the thinkers.} \\ \text{the sun is the centre of the universe.} \end{array} \right.$

Which of the following are systems of philosophy ? $\left\{ \begin{array}{l} \text{stoicism.} \\ \text{agrarianism.} \\ \text{nominalism.} \\ \text{rationalisation.} \end{array} \right.$

VII. Rural, Naturalistic, Country Life Interests

Hazel catkins usually blossom in $\left\{ \begin{array}{l} \text{winter.} \\ \text{late autumn.} \\ \text{late summer.} \\ \text{early spring.} \end{array} \right.$

Trout are { brown
grey
black and white
silver } in colour.

A setter is a { lap dog.
racing dog.
sheep dog.
gun dog.

A horse's back knees are called { hocks.
fetlocks.
pastern.
withers.

Wild bluebells grow best in { marshy places.
woods.
meadows.
heaths and moors.

A young hare is called { a leveret.
a cub.
a guilt.
a rabbit.

A pheasant's home is known as a { covey.
wish.
covert.
coppice.

Corn when first collected on the field is put in { ricks.
stacks.
stooks.
mounds.

Which of the following birds is first to return
to the British Isles in spring or summer? { Wild goose.
Cuckoo.
Swallow.
Peewit.

A beech leaf has a { polished
rough } surface and
a(n) { irregular
smooth } outline.

VIII. Interest in Religion, the Supernatural, and Myths

The disciple who betrayed Jesus was {
 John.
 Peter.
Judas.
 Andrew.

Practically all religions include a {
 one god.
 ten commandments.
 belief in immortality.
 saints.

“Of such is the Kingdom of Heaven” {
 was said by Christ when speaking of {
 saints.
 reformed sinners.
 baptised heathen.
children.

Valhalla was the { temple
 burial ground } of the {
 name of the { Heaven } Greeks.
 Norsemen.
 Ancient Britons.

The Lord's Prayer contains {
 Father forgive them.
Thy Kingdom come.
 Ask and ye shall receive.
 Blessed be they that mourn.

Orpheus was a { sailor
 musician } who {
 ascended to heaven }
 descended to the
 bottom of the sea } to
descended to hell
 bring back Eurydice.

What prophet was becoming famous {
 during the youth of Jesus? {
 St. Peter.
 Elijah.
John the Baptist.
 St. Paul.

Who struck the rock and drew forth {
 water miraculously? {
 Elijah.
Moses.
 Abraham.
 Christ.

Which of the following was a great mystic? { St. Theresa.
St. Augustine.
St. Christopher.
St. Francis.

Which of the following words have close religious connections? { sacrum.
eramite.
Eli Sabacthani.
stalagmite.

IX. Literary, Dramatic (including Drama in the Press) Interests

"Peter Pan" is about a little boy who { wouldn't grow up.
ate a lot of pancakes.
kept a pet lion.
climbed a beanstalk.

Shakespeare wrote a play called { She Stoops to Conquer.
King Midas.
The Tempest.
Spears and Swords.

The stories of Sherlock Holmes were written by { Edgar Wallace.
Rider Haggard.
H. G. Wells.
Conan Doyle.

"Man and Superman" was written by { Bernard Shaw.
Galsworthy.
Oscar Wilde.
Carlyle.

Which of the following are characters from Dickens? { David Copperfield.
Orlando.
Mrs. Malaprop.
Mr. Micawber.
Sir Roger de Coverley.

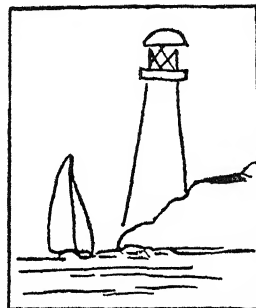
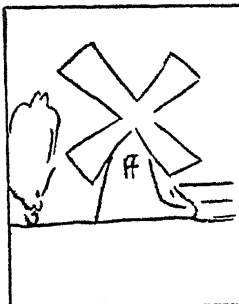
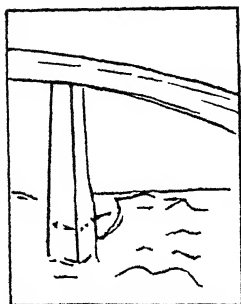
A play with exaggerated feelings is called a 4.

A play that ends happily is called a 3.

A play that ends sadly is called a 1.

Write 1, 2, 3, 4, or 5 at the end of each line above to show which of the words below will complete the sentence properly.

Which of these is the copy of a picture by a great painter?
(Indicate by a cross.)



Michael Angelo, who lived { at the Renaissance,
in the 19th Century,
in the 18th Century, } was
famous as a(n) { architect.
sculptor.
etcher.

The Norman style of architecture is characterised by { Doric column.
rounded decorated arches.
pointed windows.
flying buttresses.

Which of the following singers can reach the highest note? { baritone.
contralto.
tenor.
soprano.

Which of the following artists introduced emphasis on shape and colour itself without trying to make an accurate representation of the object? { Constable.
Whistler.
Reynolds.
Leonardo da Vinci.

XI. Interests in Dress, Decoration, Furniture, and Adornment

Which of these would be the best material for a party dress? { cambric.
taffeta.
gingham.
drill.

What would be the best for a suit for a grey-eyed schoolboy? { dark brown.
light brown.
check.
grey.

Write W, G, P, or B after each of these precious stones to show whether they are white, green, purple, or blue.

Amethyst. (P.)

Sapphire. (B.)

Turquoise. (B. or B.G.)

Spats are worn { to keep a watch-chain in place.
to clip trousers for cycling.
to prevent the colour from rubbing.
to protect the ankles.

The walls of a nursery are suitably coloured { brown.
red.
lemon.
navy blue.

Which of the following could be used as a shampoo for very fair hair? { henna.
belladonna.
linseed oil.
camomile.

A bandeau is worn { on top of a hat.
round the waist.
round a stocking.
round the head.

A man's full evening dress has { striped grey } trousers { coat with tails.
black } and a { black coat.

The heavy curtains over theatre doors are usually made of { cretonne.
casement cloth.
slub rep.
velour.

Jacobean furniture is characterised by { light wood and bulbous legs.
dark wood and twisted legs.
fine inlaid work.
dark wood and simple severe outlines.

XII. Sensual Pleasures and Comforts

“Humbugs” are usually flavoured with { liquorice.
aniseed.
fruit.
peppermint.

Egyptian and Turkish cigarettes differ from others in having { a mellow perfumed smoke.
long cork tips.
a very flat oval shape.
tobacco with a peculiar texture.

Eau-de-Cologne is a kind of { disinfectant.
scent.
wine.
silk.

Turkish Delight is a { green
brown
pink and white } sweet that is { very hard.
like jelly.
nutty.

Stout differs from Ale in being { fermented with hops.
more bitter.
stronger and more intoxicating.
dark and frothy.

When indoors on a winter's evening would you wear { shoes?
leather slippers?
polished slippers with a soft sole?
fur-lined soft slippers?

Bath salts are { first dissolved in
hot water
put straight into
a warm bath } to { replace soap.
make bath more
pleasant.
drive out a cold.

Talcum powder is used to { soothe the skin after shaving, etc.
clean teeth.
keep the scalp in good condition.
polish finger-nails.

On a cold winter's evening, would you rather { go out to a dance?
visit the theatre?
go skating or walking?
sit in an easy chair by the fire?

Hamlet called his uncle incestuous because he had married { in haste.
a woman older than himself.
a near relative.
without permission.

Each of the Concubines of King Solomon, of whom there

were { two
some hundreds
one } was a kind of { wife.
servant.
mistress.
nurse.

King Solomon was { anomalous.
idolatrous.
adulterous.
polygamous.

A man who { tells lies
makes love } in return for material gain can
reasonably be called a { prostitute.
thief.
seducer.

XIV. Social, Human, and Club Interests

Do you usually spend a day's holiday { playing games with others?
making or mending things?
reading?

If an acquaintance gave you a present that you really didn't want, would you { going walks alone?
give it back to him?
tell him it was very nice but no good?
thank him kindly?
thank him and tell him you didn't want it?
stand by in case violence is threatened?

If you saw a man and a woman quarrelling and shouting at each other in the street, would it be wisest to { tell the man to leave her alone or you'll knock him down?
put the woman under your protection and see her safely away?
ask them what it's about?

The suit that gives the highest scores in auction bridge is

{	hearts.
	diamonds.
	<u>spades.</u>
	clubs.

Underline any of these of which you have been at one time a member.

Scouts or Girl Guides.
Boys' Brigade or Y.M.C.A.
Church or Church Choir.
School Clubs.

(Score for 3 or more.)

Public-houses are open in the middle of the day from

{	10.30 to 2 p.m.
	12.30 to 3 p.m.
	11.0 to 1.30 p.m.
	10.0 to 2.0 p.m.

(Score according to local bye-laws, but usually 10.30 to 2 p.m.)

People sometimes talk about themselves

{	to make people like them.
	when they are very happy.
	<u>to get confidences in</u>
	<u>return.</u>
{	to annoy others.

Consequences is a game played with

{	cards.
	<u>pieces of paper and</u>
	<u>pencil.</u>
	dice.
{	counters on a board.

Which of the following represent(s) nation-wide club organisations? 1. R.A.O.B. 2. Freemasons. 3. Citizens' Union. 4. Travellers League. 5. Pansy Club.
Give the names (Christian names) of any of your friends whom you have seen during the past week (5 names or more count an answer to this question).

XV. Home Interests, Family, Parental Attachments

(Don't put down answers here unless you are certain of

Instructions for Administering

For children up to and including 15 years, $2\frac{1}{2}$ minutes is allowed on each sheet (i.e. $37\frac{1}{2}$ minutes in all) and for adults 2 minutes (i.e. 30 minutes in all). Subjects are instructed not to guess where they really do not know the answer.

Now the scores on any general information test are found to correlate quite highly with intelligence, so it becomes necessary to correct the score on each section to determine the extent of interest quite apart from the additional general "knowledge-ability" due to high intelligence.

In all but three sections, $\frac{1}{2}$ point is subtracted from the score for every 20 points of I.Q. which the subject has above I.Q.100. (Anyone between 110 and 130 would have $\frac{1}{2}$ point subtracted, 130-150 1 point, and so on.) Conversely, $\frac{1}{2}$ point is added for each 20 points of I.Q. below 100. But in sections 6, 7, and 10, 1 point is equivalent to 20 points of I.Q. This ratio has been determined empirically by a comparison of the scores of groups of different average I.Q.

When the individual's scores have thus been corrected for I.Q., his relative interest in various sections may be determined by reference to the tables on pp 142-3. The population has been divided up into five groups, each being a successive 20 per cent. of the population, from lowest to highest. By finding into which group the subject's score falls, one gives him a value from 1 to 5.

These norms are from 200 14-year-old primary school children.

The norms for boys and girls are distinct, since the interest pattern for the normal boy is widely different from that for the normal girl.

On the basis of these 1 to 5 scores, a profile can be constructed as shown on pp. 144-5. The 'normal' profile would, of course, be a straight line, down the middle section.

NORMS OF INTEREST TEST

No of Section	Interest (Name)	Pentile Scores				
		(i e. 20% of population fall in each section)				
		1	2.	3	4	5
<i>Boys</i>						
1.	Travel .	Below 2 5	to 3 18	to 3 6	to 4 25	and above
2.	Sports	Below 3 25	to 4 12	to 4 8	to 5 75	and above
3.	Commercial	Below 1 75	to 2 3	to 3 12	to 3 95	and above
4.	Mechanical	Below 2 6	to 3 25	to 4 12	to 4 75	and above
5.	Scientific	Below 6	to 1 25	to 1 8	to 2 6	and above
6.	Things of the Mind	Below 12	to 75	to 1 5	to 2 25	and above
7.	Rural, Naturalistic	Below 2 75	to 3 75	to 4 6	to 5 75	and above
8.	Religious	Below 2 75	to 3 6	to 4 3	to 5 1	and above
9.	Literary .	Below 2 5	to 3 25	to 4 05	to 5 05	and above
10.	Artistic	Below 1 5	to 2 3	to 3 05	to 4 12	and above
11.	Decorative	Below 2 8	to 3 5	to 4 4	to 5 25	and above
12.	Sensual Pleasures	Below 3 6	to 4 8	to 5 9	to 7 25	and above
13.	Sex	Below 1 12	to 1 75	to 2 2	to 2 8	and above
14.	Social	Below 1 95	to 2 75	to 3 9	to 4 25	and above
15.	Home . . .	Below 1 5	to 2 25	to 3 0	to 3 6	and above
<i>Girls</i>						
1	Travel	Below 1 5	to 2 25	to 2 75	to 3 75	and above
2.	Sports	Below 1 25	to 2 05	to 2 6	to 3 75	and above
3	Commercial	Below 2 9	to 2 95	to 3 6	to 4 5	and above
4	Mechanical	Below 2 12	to 2 75	to 3 25	to 3 9	and above
5	Scientific	Below 8	to 1 25	to 2 09	to 2 75	and above
6.	Things of the Mind	Below 12	to 5	to 9	to 1 4	and above
7.	Rural, Naturalistic	Below 2 75	to 3 8	to 4 25	to 5 5	and above
8	Religious	Below 2 75	to 3 25	to 3 95	to 4 6	and above
9.	Literary	Below 2 8	to 3 4	to 4 25	to 4 8	and above
10.	Artistic	Below 1 6	to 2 12	to 2 6	to 3 4	and above
11.	Decorative	Below 2 8	to 4 25	to 5 5	to 6 5	and above
12.	Sensual Pleasures	Below 5 5	to 6 4	to 7 05	to 7 95	and above
13	Sex . . .	Below 1 05	to 2 6	to 3 25	to 3 95	and above
14	Social . . .	Below 2 5	to 3 12	to 3 8	to 4 6	and above
15	Home . . .	Below 1 5	to 1 95	to 2 5	to 3 5	and above

The same procedure is used for scoring adults, but the following norms are quite tentative, being based on only 54 cases.

Here the allowance for intelligence appears to be $\frac{1}{2}$ point for 20 points of I.Q. on sections 1, 3, 4, 5, 8, 10, 13, and 15, and 1 for 20 points of I.Q. on 2, 6, 7, 9, 11, 12, 14.

NORMS OF INTEREST TEST FOR ADULTS

No of Sec.	Name of Section	Pentiles				
		1. *	2	3	4	5
Men						
1	Travel	Below 2 85	to 3 5	to 4 3	to 5 3	and above
2.	Sport	Below 5 4	to 5 8	to 6 5	to 7 4	and above
3.	Commercial .	Below 3 85	to 4 85	to 5 8	to 6 75	and above
4.	Mechanical .	Below 2 95	to 3 4	to 4 75	to 5 75	and above
5.	Scientific .	Below 1 9	to 2 8	to 3 9	to 5 35	and above
6.	Things of the Mind	Below 8	to 1 5	to 2 95	to 4 5	and above
7.	Rural, Naturalistic	Below 4 1	to 4 75	to 5 1	to 5 75	and above
8.	Religious .	Below 4 25	to 5 25	to 5 9	to 6 8	and above
9.	Literary	Below 3 95	to 4 6	to 5 4	to 6 2	and above
10.	Artistic	Below 4 8	to 5 25	to 5 15	to 6 95	and above

NORMS OF INTEREST TEST FOR ADULTS (*cont*)

No of Sec	Name of Section	Percentiles				
		1	2	3	4	5
Men						
11	Decorative	Below 2 75	to 3 75	to 4 45	to 5 95	and above
12	Sensual Pleasures	Below 5 85	to 6 25	to 7 1	to 7 75	and above
13	Sex	Below 3 5	to 4 2	to 4 75	to 6 5	and above
14	Social	Below 1 5	to 2 6	to 3 3	to 3 9	and above
15	Home	Below .95	to 1 75	to 2 1	to 3 25	and above
Women						
1	Travel	Below 2 65	to 3 45	to 4 35	to 5 45	and above
2	Sport	Below 2 75	to 3 9	to 5 75	to 7 15	and above
3	Commercial	Below 3 9	to 4 9	to 5 95	to 6 95	and above
4	Mechanical	Below 2 35	to 3 85	to 4 75	to 5 9	and above
5	Scientific	Below .95	to 1 95	to 2 5	to 3 5	and above
6	Things of the Mind	Below 1 35	to 1 85	to 2 5	to 4 2	and above
7	Rural, Naturalistic	Below 2 75	to 4 25	to 5 75	to 6 85	and above
8	Religion	Below 4 95	to 5 65	to 6 25	to 6 95	and above
9	Literary	Below 3 8	to 4 5	to 5 25	to 6 5	and above
10	Artistic	Below 4 25	to 5 25	to 5 8	to 6 75	and above
11	Decorative	Below 5 25	to 6 3	to 6 8	to 7 3	and above
12	Sensual Pleasures	Below 6 25	to 6 85	to 7 25	to 7 65	and above
13	Sex	Below 3 25	to 3 95	to 5 6	to 6 75	and above
14	Social	Below 2 3	to 2 85	to 3 35	to 4 98	and above
15	Home	Below 2 65	to 3 1	to 3 45	to 4 3	and above

Attempts have been made to bring these fifteen interests under two or three main headings, but no such classification can be entirely satisfactory. Psychoanalytic findings show that interests logically utterly remote may spring from the same unconscious pattern and satisfy the same desires. All manner of classifications of interests, objective, subjective, social, material, group, etc., have been suggested, but none has been shown to contain grouped elements which actually correlate highly together. For different purposes, different arrangements are useful. We have chosen a classification of the fifteen interests which will be of value more especially in clinical work, and which is illustrated in the accompanying profiles. It is based on the nature of the emotional expression achieved in the various interests, whether simple, or with projected emotion or highly sublimated, etc. (i) Interests in Direct Activity 1, 2, 3; (ii) Complex, objective, coldly intellectual interests, 3, 4, 5, and 6; (iii) Interests of an æsthetic-religious type with projected emotion, 7, 8, 9, 10, and 11; (iv) Sexual and sensual interests, 12 and 13; (v) Social, Human, and Home Attachments, 14 and 15. (i) and (ii) overlap in section (3), and there are other sections which might be

INTEREST TEST PROFILES

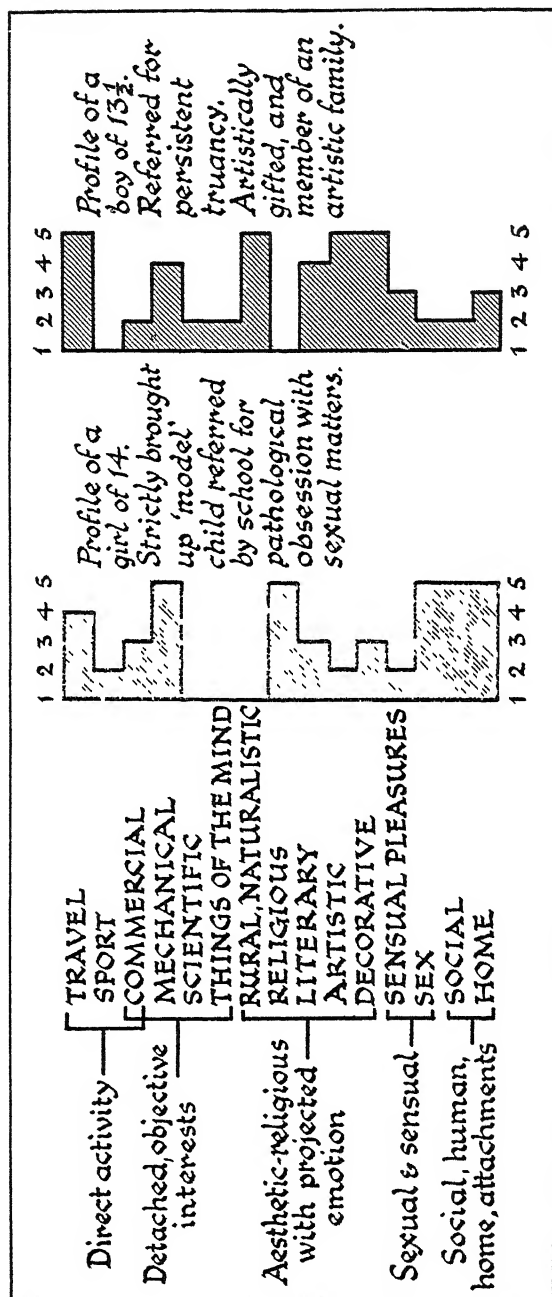


FIG 47 (a), Children

INTEREST TEST PROFILES

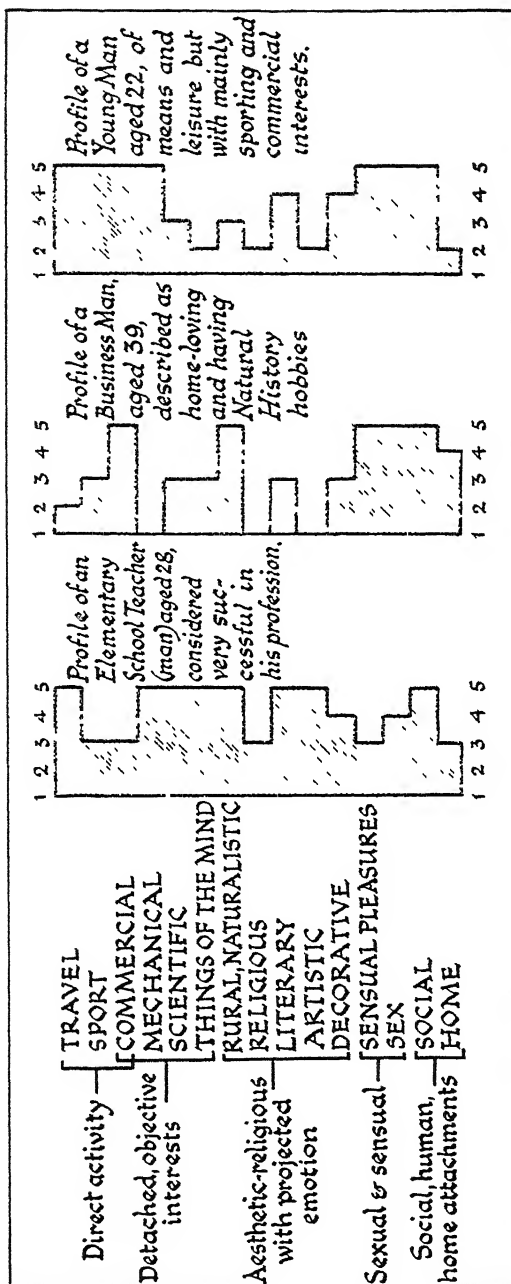


FIG 47 (b) Adults

differently arranged. The test is, therefore, best used, paying attention to each section as it stands, and only secondarily heeding the cruder classification into the simpler and larger groupings just suggested.

4. Measures of Attitude

The following tests, designed by Thurstone, form the best standardised and uniform series of attitude measures yet available. They are, of course, open to the objections raised earlier in this chapter (susceptibility to dishonesty and self-deception), and the norms, which are for American subjects, would almost certainly need revision for this country, being closely dependent on local atmosphere. A test on 650 students with one of these scales (Race Attitude) repeated a month later, gave a consistency coefficient of 0.88.

THURSTONE ATTITUDE SCALES

Attitude towards God .	E J. Chave and L S Thurstone
Attitude towards War	D D Deoba
Attitude towards the Negro	E D Hinckley.
Attitude towards the Law	D Kalz
Attitude towards Capital Punishment	R C Peterson.
Attitude towards the Chinese	R C Peterson
Attitude towards the Germans	R C Peterson
Attitude towards War	R C Peterson
Attitude towards Censorship	G C Rosander and Thurstone
Attitude towards the Constitution	G C Rosander and Thurstone
Attitude towards U S A	G C. Rosander and Thurstone
Attitude towards Prohibition	H N Smith and Thurstone
Attitude towards Patriotism . . .	M B Thick and Thurstone
Attitude towards Communism . . .	Thurstone
Attitude towards Evolution	Thurstone
Attitude towards the Church . . .	Thurstone and E J Chave
Attitude towards Immigration . . .	Thurstone
Attitude towards League of Nations	Thurstone
Attitude towards Free Trade	Thurstone
Attitude towards Monroe Doctrine	Thurstone
Attitude towards German War Guilt	Thurstone
Attitude towards the Bible	Thurstone
Attitude towards Economic Position of Women	Thurstone
Attitude towards Foreign Mission	Thurstone
Attitude towards Divorce	Thurstone
Attitude towards Freedom of Speech	Thurstone
Attitude towards Social Position of Women	Thurstone
Attitude towards Honesty in Public Office	Thurstone
Attitude towards Preparedness	Thurstone.
Attitude towards Public Ownership	Thurstone
Attitude towards Unions	Thurstone
Attitude towards Birth Control . .	Thurstone and C K A Wang
Attitude towards Sunday Observance	Thurstone and C K A. Wang.
Attitude towards the Treatment of Criminals	Thurstone and C. K. A Wang.

Also Allport's *Measurement of Students' Attitudes*, dealing with aspects of college life, obtainable from Messrs. Stoelting; and Watson's *Public Opinion Test*—a means of measuring deviations from common opinion or 'fair-mindedness' in religious, economic, and other issues, obtainable from Messrs. Stoelting.

CHAPTER V

TESTS OF TEMPERAMENT AND DISPOSITION

1. Temperament

ONE of the difficulties in assessing temperament lies in the fact that no one knows where temperament ends and character begins. We may, indeed we must, adopt contingently the *a priori* distinction of the text-books that temperament is the sum-total of reactions determined by physiological conditions, and that character is a matter of the organisation of the conative drives. This distinction is most lucidly drawn, perhaps, by McDougall (*Outlines of Psychology*), who also defines disposition as the predominance of a particular instinct.

Experiment is already showing that temperament and character may be much more complexly interwoven, yet the division adopted here will probably remain practically convenient for a long time.

No difficulty arises in classifying dispositions—they correspond to the fourteen or more instincts or propensities, but the varieties of temperament distinctions that have been advocated are rather numerous.¹ For practical purposes, however, we can confine ourselves to the following, which are the only patterns with a fairly sound scientific foundation:

- (1) Introvert-extravert or surgent-desurgent.
- (2) Cyclothyme—Schizothyme (the types of Kretschmer and Jaensch).
- (3) Endocrine gland types.

The last-named may be diagnosed with fair reliability by physical clinical signs,² but there are as yet no quantitative tests which could be given on the physiological side by

¹ See R. B. Cattell, "Temperament Tests—I," *Brit. J. Psychol.*, xxiii, 1933, also A. A. Roback, *The Psychology of Character* (Kegan Paul).

² See *Endocrine Disorders*, by Gurschmann, on medical aspects

the medical man nor any tests whatever that could be used on the temperamental side by the psychologist. Indeed, the very description of the endocrine temperament types is so uncertain that, except in extreme instances, the concepts are rarely of use in, e.g., vocational guidance or the diagnosis of maladjustments, so that it is useless to deal further with these in a handbook.

(a) SURGENCY-DESURGENCY TESTS

Recent research suggests that Jung's description of the introvert-extravert types does not entirely hold the mirror up to nature. The group of traits which he thought to cohere does not in fact do so satisfactorily, and it seems likely that the introvert conception includes a mixture of two patterns. The traits which *do* cluster are as given below, and have been called the Surgent and Desurgent temperaments.¹ The resemblance of introversion-extra-version to this conception is, however, so close that the terms might almost be used interchangeably. Nevertheless, introversion as used by most writers, undoubtedly includes desurgency of temperament plus a certain type of maladjustment.

The following is a list of the principal traits, beginning with the most important, i.e. those most saturated with the general factor. The full meaning given to the first seven traits (*a-g*) is given in more detail below the list. Needless to say, persons corresponding to the extremes of these polar opposites are rare; most people would fall at a middling assessment in accordance with the normal distribution curve.

Temperament Traits : 'C' Factor

Surgent	Desurgent
(or Extravert Pattern)	(or Introvert Pattern)
(a) Cheerful	(a) Gloomy
(b) Natural	(b) Formal
(c) Sociable	(c) Unsociable

¹ See "Temperament Tests," I, *Brit J Psychol*, xxiii, 1933, and "Temperament Tests," II, *Brit J Psychol*, xxiv, 1933, by R B Cattell

Temperament Traits : 'C' Factor—continued

Surgent

Desurgent

(or Extravert Pattern)

(or Introvert Pattern)

(d) Humorous

(d) Earnest

(e) Adaptable

(e) Conservative

(f) Gregarious

(f) Exclusive

(g) Quick of Apprehension

(g) Slow of Apprehension

(Hasty

Introspective)

Forward

Shy

(Verbose

Taciturn)

(Optimistic

Pessimistic)

Co-operative

Distrustful

Original

Banal

(Realistic

Artistic)

Expressive

Inhibited

(Sensuous

Not Hedonistic)

Placid

Given to Mental Con-
flict.

(Confident

Anxious)

(Tactful

Tactless)

Sophisticated

Naive

(Contented

Ambitious)

(a) Inclined on the whole to be merry, gay, cheerful, for long periods Indulges in light-hearted laughter.

Tendency to be gloomy and solemn, or at least stodgy and bored Not melting easily into happy laughter

(b) Naturally graceful and charming, makes easy contacts without formality Is natural and easy with all kinds of people

Prefers human contacts to be regulated by etiquette and cold formality Is always precise and conventional in greeting, etc

(c) Mixes well. Likes to meet people Makes contact with strangers easily and unreluctantly

Not fond of human intercourse for its own sake Avoids meeting people, especially strangers. Dislikes human contacts

(d) Turns readily and passes easily to the humorous aspect of things Fond of witty sallies and joking Takes few things seriously.

Inclined to be humourless Deadly earnest always. Not deflected easily into humour Seldom makes jokes spontaneously—in passing.

(e) Adaptable to changes in circumstances. Not upset by enforced changes of home, work, habits. Likes to have changes.

Upset by anything demanding change in habit. Conservative in small things, and retains accustomed things (not necessarily in politics). Likes same old walks, tunes, books, neighbourhood.

- | | | | |
|-----|--|--|---|
| (f) | Likes to be in crowds
being in human society
has a large circle of acquaintances | Fond of
Usually,
alone | Fond of solitude
Spends much time
Has one friend or small exclusive
group. |
| (g) | Sees point of anything at once
Quickly grasps new material and
takes in things at a glance. Jumps
at conclusions and gives opinion
accordingly | Opposite qualities
and in gathering situation | Slow in thinking
Heavy
Takes a long time to come to conclusion |

The general factor behind these traits, a high degree of which gives a surgent temperament and a low-degree desurgency, has been given the symbol 'c' by Garnett, and by this we shall refer to it hereafter.

Researches on the speed factor in actual tests of cognitive performance revealed the existence of a factor over and above 'g' which has been called 'f' for 'fluency of association,' and which reveals itself particularly in quickness of thinking, width and range in association and imagination.¹

Now it has since been found that 'f' correlates quite highly with 'c,' so that we have in 'f' tests an objective test of a definite temperament type and a test moreover of higher validity than any other yet discovered in the realm of temperament testing.²

The following 'f' test for practical situations has been devised by the writer in collaboration with Miss Studman³ and Miss Simmins, of the Institute of Medical Psychology, and has been standardised on 450 14-year-old children, 100 11- and 12-year-olds, 50 9- and 10-year-olds, and 50 adults.

About 20 minutes is required for testing (15 minutes' actual testing time), and the test can be given either as a group or individual test to children over 10 and adults, but only as an individual test to children below that age. Since, as in most temperament, interest, or character tests, a correction has to be made for intelligence when the fullest accuracy is to be achieved, this test should be preceded by at any rate a rough test of 'g.'

¹ See E. Bernstein, "Quickness and Intelligence," *Brit. J. Psychol., Monog. Suppl.* No. 7, and H. L. Hargreaves, "The 'Faculty' of Imagination," *Brit. J. Psychol., Monog. Suppl.* No. 10.

² "Temperament Tests," II, by R. B. Cattell, *loc. cit.*

³ See, for fuller implications of the tests, Studman, "Studies in Experimental Psychology," *J. Mental Sci.*, 1935.

Instructions for Administering

There are five sub-tests, each of 3 minutes:

1. Pictures, 3 periods of 1 minute.
2. Word Series, 3 periods of 1 minute.
3. Completing Forms, 3 periods of 1 minute.
4. Topics, 6 periods of $\frac{1}{2}$ minute.
5. Ink Blots, 3 periods of 1 min.

Pictures

Three pictures (Tree, Street Corner, and Library), see pp. 153-5-7. Pictures to be face downwards on the desk with (1) uppermost.

Instructions to Subject.

Turn over the top picture, and you will see a picture of a tree with a cross marked underneath it.

I want you to think of as many *different* things as you can that might be drawn under the tree somewhere about where the cross is. You might not be able to put them all in the same picture together, of course. Write down anything you can think of as quickly as you can.

With children of 10 years and under the examiner says, "Tell me anything you can think of," and writes down the things given.

"Are you ready? Go." (One minute)

Repeat for two other pictures.

Scoring.—One point for each idea, e.g. "a cat looking up at a bird," three points in all, for *cat*, *looking at*, and *bird*.

Word Series

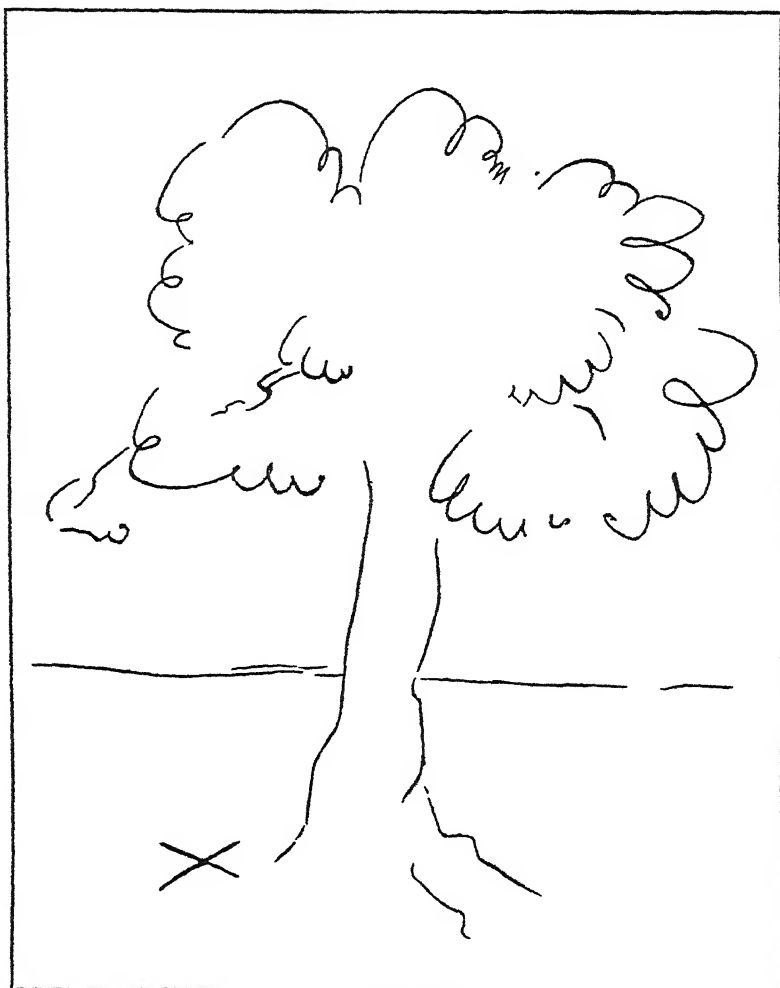
Material.—Pencil and paper.

Instructions to Subject.

(a) I am going to give you a minute, and I want you to write down (or tell me) as many things as you can think of that are 'round' or could be round. A penny would do. Give me as many as you can.

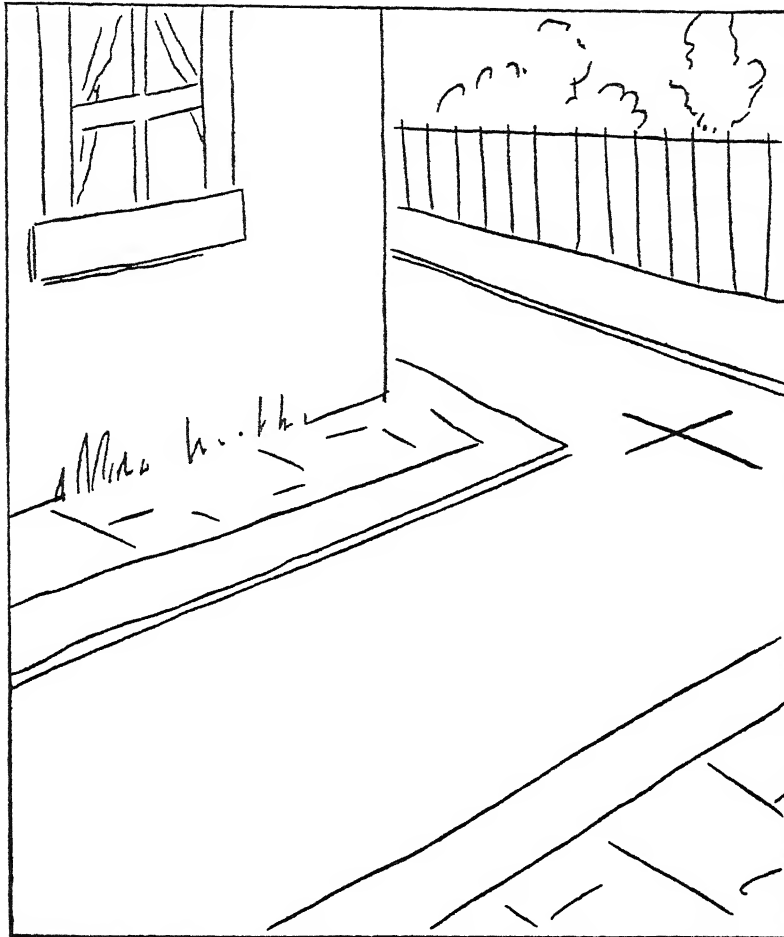
"Ready? Go."

(b) Now write a list of things we can 'eat.'



PICTURE 1

FIG. 48.



PICTURE 2.

FIG 49



PICTURE 3

FIG. 50.

(c) Now write as many words as you can, beginning with 's'—any words you like.

With children of 10 years and under, the examiner says, "Tell me all the things you can think of," and then writes them down.

One minute allowed for each set.

Scoring.—Number of words (things).

Completing Forms

Materials.—Three foolscap sheets each having a simple figure, repeated as shown in Fig. 51 below.

Examiner demonstrates on first sheet or on an enlarged copy of it on the blackboard.

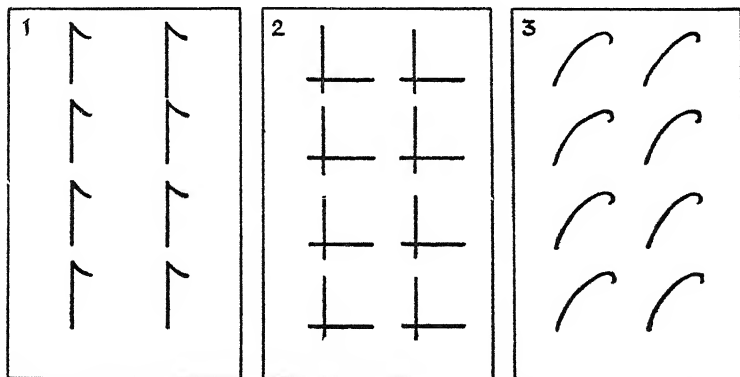
"You have some lines on your papers like this" (points to blackboard). "I want you to add a few lines to each one of them to turn them into something."

E.g. "This looks rather like the top of a flag, so you might draw a few lines to show where the rest of the flag would come—the flag might look like this."

(Examiner demonstrates.)

"Make each one into something different. It doesn't matter a bit what the drawing is like—it is just to see how many different things you can think of. Don't spend a lot of time finishing each drawing. As long as I can see what it is meant to be, that is enough."

FIG 51.



(Three Test Sheets Allow 1 minute for each sheet.)

After subjects have finished the first sheet (example), examiner looks at it to make sure instructions are understood.

Scoring.—Number of intelligible drawings on all three sheets (excluding flag drawn as an example).

Topics

“ I’m going to give you a subject, and I want you to say as many things as you can about it—e.g. suppose I say ‘ a bad cough,’ you say as many things as you can think of about a bad cough—either disconnected things like, ‘ A bad cough is not often serious ’; ‘ It’s annoying when you hear someone with a bad cough in church ’; ‘ I had a bad cough last week, and had to stay in bed for a few days ’; ‘ I felt shaky when I got up, but this fine weather has quite cured it.’

“ It doesn’t matter a bit whether you go rambling on about one thing, or if you say all sorts of disconnected things. Just do whichever is easier. I want you to say as many things as possible. Quantity, not quality, counts in this test.

“ Try this one—‘ A man going up a ladder.’—Now, just say as many things as you can think of about a man going up a ladder.”

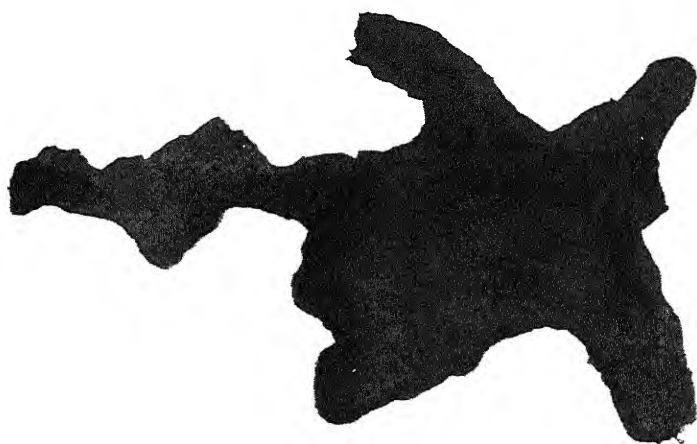
List of Topics to be given :

- | | |
|------------------------------|--------------------|
| (1) A man going up a ladder. | } 30 seconds each. |
| (2) A dog barking. | |
| (3) A house on fire. | |
| (4) A train journey. | |
| (5) A parcel. | |
| (6) A poor boy. | |

Scoring.—Number of significant words—i.e. omitting a, the, and, but counting the subject (man going up ladder, dog barking) where repeated.

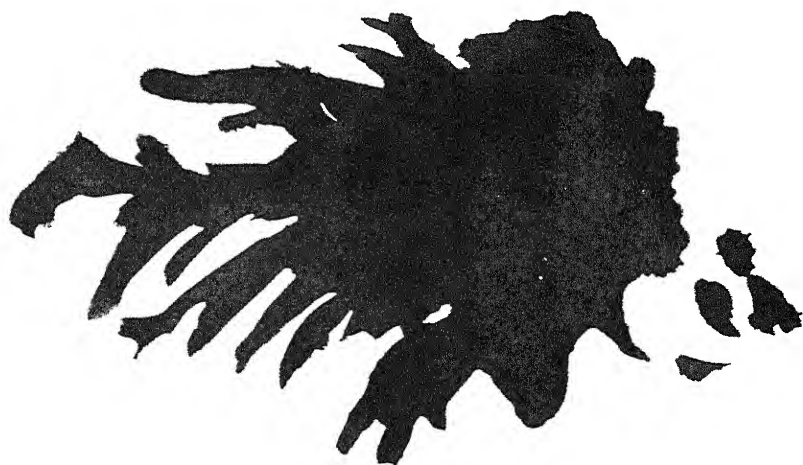
Ink Blots

Material.—Three ink blots as shown (modelling within the blots should be discernible), preferably individual copies,



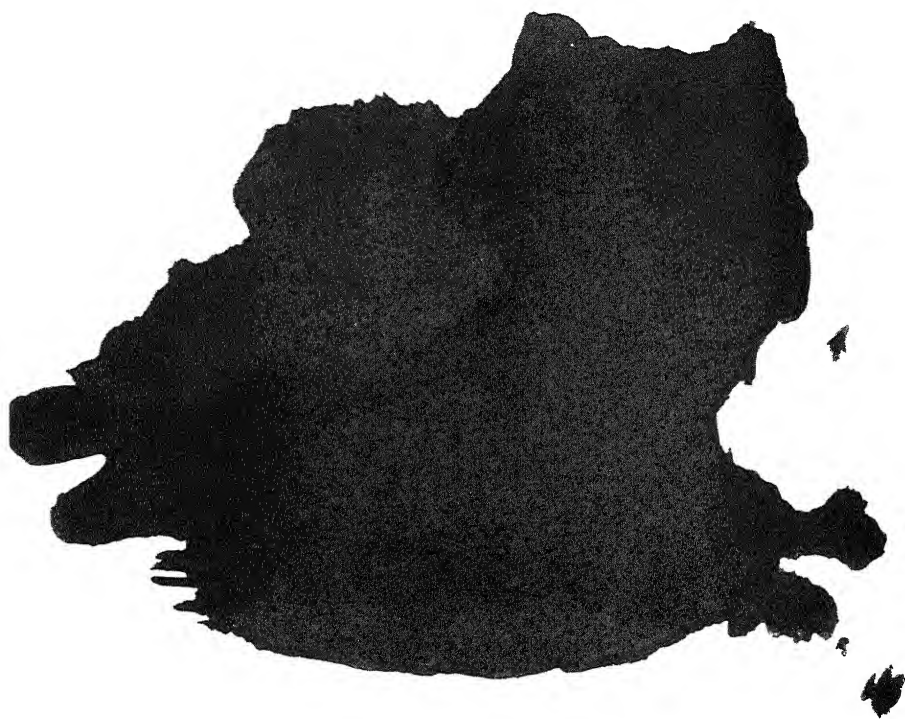
BLot I

FIG. 52



BLot II

FIG 53



BLot III

FIG 54

but a possible method is to have a large sheet on the black-board for whole class to see.

Instructions.—Examiner arranges for first blot to be exposed and says:

“ Now, this is just a blot of ink; try to think of something it looks like. See how many things you can see in it, just as you see things in clouds or in the fire. It isn’t exactly like anything, of course, but try to think of as many things as you can that it looks rather like.

“ You may think of it as turned round or look at it sideways or upside down if you like.

“ Write down on your paper all the things you can think of.”

Children of 10 or under *tell* one the things they can see.

Time allowed.—One minute for each blot.

Scoring.—Number of items conceived.

Total Score on Fluency Tests.—To compute total score first multiply the score on the third test by three, halve the score on the fourth test (count a half as one), and double the score on the last test. This procedure is necessary in order to equalise the weights of the constituent tests in the total.

Apparatus Needed.—Three form completion papers, three ink blots, three pictures; stop watch. Pictures and completion forms may be reproduced from models shown here. Ink-blot photos may be obtained from the author.

Evaluating the Score.—‘ f ’ score correlates about .3 with ‘ g.’ Because of this, the following correction for I.Q. (empirically obtained) is required.

At 10 and 11 years. Add 1 to ‘ f ’ score for each point of I.Q. below 100.

Subtract .25 point from ‘ f ’ score for each point I.Q. above 100.

At 12 years. Add 1 point from ‘ f ’ score for each point I.Q. below 100.

Subtract .5 point from ‘ f ’ score for each point I.Q. above 100.

At 13 years. Add 1 point from 'f' score for each point I.Q. below 100.

Subtract .75 point from 'f' score for each point I.Q. above 100.

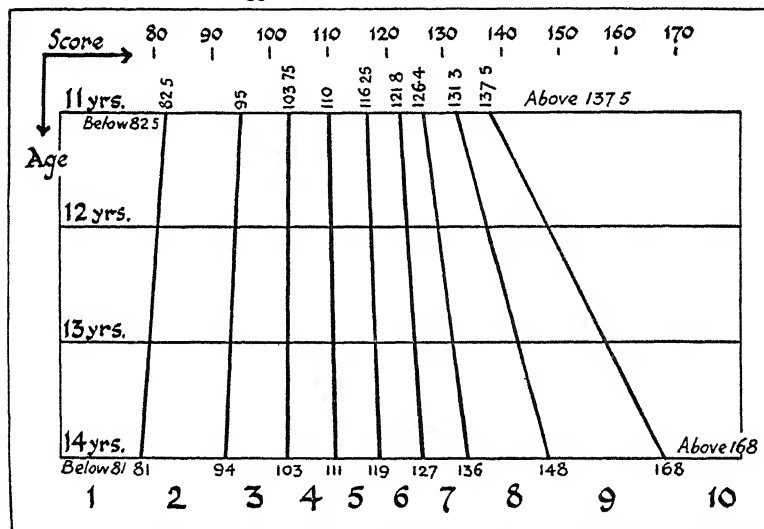
At 14 years. Add 1 point from 'f' score for each point I.Q. below 100.

Subtract 1 point from 'f' score for each point I.Q. above 100.

These are round figures obtained from averaged 'f' scores of three 'g' groups.

The results thus corrected can be converted finally to decile scores by the following table. Example of working: a child of 12 with a raw score (corrected for I.Q.) of 91 has a decile score of 2, i.e. 8 out of 10 are above him and 1 below. He would therefore be of a markedly desurgent (introvert) temperament.

FIG. 55—Decile norms for 'f' scores



Instructions—After correcting the 'f' score for I.Q. as described above, drop a perpendicular from the 'f' score position on the scale at the top to the year level concerned and note into which of the ten decile divisions the score falls

In the research in which the correlations of fluency with surgency were first discovered¹ an agreement of $0.6 \pm .07$

¹ "Temperament Tests," II, by R. B. Cattell, *loc. cit*

was found, but this was with students at adolescence, when the normal temperament is apt to be modified and complicated. Since the test, moreover, was in its crude beginnings, we may reasonably expect a better correlation of test and temperament in subsequent researches.

Actually on a preliminary trial with the present test the correlation of high 'f' with high surgency (extraversion) was no higher, being 0.65 ± 0.07 for 10-year-old children and 0.64 ± 0.07 for 14-year-olds, but it is expected that a second trial will yield greater validity. Its consistency coefficient in the latter group was $.78 \pm .07$. The oral form promises to be rather better than the written, since speed of writing becomes a factor in the latter, and this has a low correlation with 'f,' consequently reducing the correlation with surgency.

No one yet knows why this correlation of 'fluency' with the surgent temperament reaches so high a figure whilst refusing to improve further. Investigation of individual cases of discrepancy between 'f' score and 'c' is going on, since it is usually a few marked cases only which reduce the correlation. Possibly part of the explanation lies in the rather low consistency of 'fluency' itself, due to its varying readily with fatigue, state of health, and mood (*i.e.* functional fluctuation). Even so, this test remains the best objective test of a definite temperament so far discovered.

Other Tests of introversion-extraversion are only on the basis of ratings, self-ratings, and answers to questionnaires on such moderately indirect questions as:

Have you unburdened your troubles and worries?	{	very freely. inclined to be confidential. tell some trouble. keep all to myself.
--	---	---

What use have you made of day-dreams?	{	always day-dreaming. many day-dreams. some practical. generally practical. plan, but do not day-dream.
---------------------------------------	---	--

Available tests (all are American, and most are obtainable at Messrs. Stoelting's) include Colgate Personal Inventory C.2, Consistency high; Conklin Questionnaire on Introversion-Extraversion.

Freyd-Heidbreder Questionnaire on Introversion-Extraversion.

Gilliland and Morgan's Measure of Introversion-Extraversion.¹

Kent-Rosanoff Questionnaire.

Laird Personal Inventory on Introversion-Extraversion.

Marston Personality Rating Scale.²

Neymann and Kohlstedt's Diagnostic Test of Introversion-Extraversion.³

Root's Short Test of Introversion-Extraversion.⁴

The consistency of each of these tests with itself leaves nothing to be criticised, yielding a coefficient near .8 in most cases. With one other, however, their agreement is frequently negligible. Hovey⁵ found very small agreement on introversion as measured by the Laird, the Conklin, and the Freyd questionnaires, whilst Weber and Maigren found the same unsatisfactory result with Laird and Conklin's questionnaires.

Apart from the subject's poor knowledge of his own standing (most people think themselves introverts) and from questions of conscious and unconscious honesty discussed on pp. 120 and 193, the fact stands out that the authors have not troubled to prove that the clusters of qualities which they attempt to assess are in fact correlated to form an 'introvert' type. Guthrie⁶ has correlated objective tests of some of these tendencies and found no relation. The

¹ See *J. Abn. and Soc. Psychol.*, 1931, xxvi. Attempted validation with insane (cycloid-schizoid) patients

² See *Univ. of Iowa Studies in Child Welfare*, 1925, iii, No. 3

³ See *J. Abn. and Soc. Psychol.* Again validated really on schizophrenic patients, not on introverts. Also Root and Root, "A Study of the Neymann Kohlstedt Diagnostic Test for Introversion-Extraversion," *J. Abn. and Soc. Psychol.*, 1932, xxvi

⁴ See *Personnel J.*, 1931, x, 250-3

⁵ "Measures of Extraversion-introversion tendencies and their Relation to Performance under Distraction," *J. Genet. Psychol.*, 1929, xxxvi

⁶ E. R. Guthrie, "Measuring Introversion and Extraversion," *J. Abn. and Soc. Psychol.*, 1927, xxii

same was found by the present writer with estimates of some of these qualities.¹

The usefulness of these scales is therefore severely limited by a variety of weaknesses. They seem to be valid only for extreme or psychotic groups, and in less extreme types only where honesty of self-judgment can be pre-supposed.

Introversion-Extraversion by Word Association

A valuable technique—too long to describe here—for determining introversion-extraversion by word responses to exposed or sounded words will be found in Jung's *Studies in Word Association*.

(b) TESTS FOR CYCLOTHYME-SCHIZOTHYME AND ALLIED TYPE DISTINCTIONS (KRETSCHMER, RORSCHACH, JAENSCH)

We pass here from the contemplation of a commonly accepted, experimentally proven, temperament distinction (surgency-desurgency or introversion-extraversion) to distinctions which, though of undoubted interest and importance, have scarcely been clarified and verified enough to be described succinctly without some degree of dogmatism and error.

The cyclothyme-schizothyme distinction is superficially very similar to Surgency-Desurgency and, as already pointed out, has in fact been used as the basis for introvert-extravert questionnaires. But this type pattern has different roots—it arises from the classification of psychotics and the study of the abnormal (Bleuler and Kraepelin). McDougall² has drawn an important but subtle difference between the introvert and the schizothyme, as they are commonly described. The researches of the present writer are in agreement with this distinction, and point to the conclusion³ that the schizothyme temperament is the desurgent temperament plus a secondary factor 'a' (a factor involving secretiveness, 'extremeness,' stinginess,

¹ R. B. Cattell, "Temperament Tests, I Temperament," *Brit J. Psychol.* xxiii, 1933

² *Outline of Abnormal Psychology*, p. 392

³ "Temperament Tests, I," *Brit J. Psychol.* xxiii, 1933.

subjectivity of thought, pessimism, unemotionality, tactlessness¹).

CHARACTERISTICS OF THE CYCLOTHYME-SCHIZOTHYME TYPE DISTINCTION

<i>Cyclothyme</i>	<i>Schizothyme</i>
Warm-hearted.	Cold, distant.
Natural.	Correct, formal.
Generous.	Stingy.
Co-operative.	Fearful and hostile.
Balanced, compromising.	Extreme, idealistic.
Frank.	Secretive.
Emotional.	Calm and guided by cold will.
Varying in emotional mood.	Unchanging.
Trustful.	Distrustful.
Objective, realistic.	Prone to start with theories on principles and to fix facts into them
Optimistic.	Pessimistic.
Tendency to enjoy gifts of life.	² Puritanical, self-punishing.
Humorous.	Not understanding humour.
Sociable.	Unsociable.

Although there is, unfortunately, no common admission of and inquiry into the fact by the schools of Kretschmer and of Jaensch, the latter's integrate-disintegrate type distinction closely resembles Kretschmer's cyclothyme-schizothyme division, partly in description, but particularly in reaction to the experimental test situations which we shall describe below.

Apart from the integrate-disintegrate distinction, the essential types isolated by Jaensch's school, by a happy combination of psychological and physiological research are: (1) The T-type (tetanoid), characterised by persistent eidetic images (following the normal negative after-image),

¹ Note the part which these play in Kretschmer's list below.

² Down to and including this trait, the list is that found to cohere by Sahai's research (*Circular Mentality and Pyknic Body Build*, University of London Library) and that of the present writer. All are found in Kretschmer's description, and the present writer suggests that those below this point are mainly surgency traits

which intrude when not wanted and generally disturb imagination; irritability of the peripheral nerves, tense muscles and pinched face, emotionality, fidgetiness, over-activity, and restlessness. Associated with defect of parathyroid glands. Most readily tested by the tests for intensity of eidetic imagery worked out by Jaensch.¹ (2) The B-type (Basedowoid). Eidetic imagery more fluid, controlled and more like a memory image. High metabolic rate, reflective turn of mind, but rich, imaginative, and emotional life. This type seems (on objective evidence of gland condition) to be the same as the hyperthyroid type described below. Jaensch's T and B types are well established clinically, but not enough is yet known about the wider influences of these temperaments upon behaviour to justify more detailed treatment here, neither are tests available beyond those described above.

The objective laboratory tests for distinguishing cyclothyme and schizothyme or integrate and disintegrate are not available in standardised form—indeed, the above-mentioned conflict of theory would make such standardisation premature—but the tests are set out here in order that those who wish to develop tests for this temperament distinction may have a prepared basis for doing so.

*Tests*² (for cyclothyme-schizothyme or integrate-disintegrate) :

(1) When compound material (involving colour, forms, meaning, movement, etc.), is exposed, with the usual brief exposure in a tachistoscope,³ the schizothyme makes better scores than the cyclothyme if asked to abstract one particular aspect, e.g. to note colour only or form only.⁴

The C's, on the other hand, observe more things than they are asked to observe.

¹ *Eidetic Imagery and Typological Methods of Investigation.*

² In addition to actual tests the association of the rounded, pyknic body build (especially breadth of face) with cyclothyme and long, leptosomatic build with schizothyme temperament should be recorded. The correlation is, however, low—about 0.2 (see Sahai, p. 166).

³ An apparatus for permitting controlled instantaneous exposures of pictures, printed words, etc.

⁴ *Körperbau und Charakter*, by Kretschmer, especially p. 180, reporting Kibler's research.

(2) When reaction times are measured under conditions of distraction (choice reactions to two or more coloured lights in which yet another distracting light may at any moment be switched on), the C's are more disturbed.

The fraction $\frac{\text{Reaction time under distraction}}{\text{Reaction time under simple conditions}}$ is significantly higher for C's; but more errors are made by S's.

(3) In tachistoscopic exposure of letters, the span (number of letters perceived) is greater for C's than S's.²

(4) The curve of pressure in writing (Kraepelin's writing table) is more sudden and irregular with S's.²

(5) Perseveration, as measured by Wiersma's disc experiment (see p. 211 for perseveration measurement), is greater for S's.²

(6) Speed of finger tapping (natural tempo) is greater for S's.² The present writer's investigations, however, do not bear this out.³

(7) When left to observe, without specific instructions, coloured objects in a tachistoscope, C's (or integrates) pay more attention to colour and S's (or disintegrates) to form.^{2, 4}

(8) This difference, as also differences in the subjectivity of associations, reveals itself in Rorschach's coloured blot tests, which may therefore be used as a temperament test.

Rorschach's Test.—This consists of 10 symmetrical ink blots, 5 coloured, 5 uncoloured, on semi-gloss paper 7 × 10 inches. The subject sees them one by one, and is told to "interpret in any way you choose and in your own time." His responses are recorded and analysed with regard to (1) number, (2) time, (3) association on whole or on detailed parts, (4) nature of associations—inanimate objects, animals, etc., (5) number of uncommon, original associations, (6) presence or absence of movement, colour, forms.

¹ *Op cit*, p 179

² Kretschmer, *op cit*

³ *Op cit*, R B Cattell

⁴ O Oeser, "Some Experiments on the Abstraction of Form and Colour," I, *Brit J Psychol*, xxii, 1932, II, *Brit J Psychol*, xxii, 1932

Rorschach's standardisation¹ provided typical percentages for each of these, and the variation of percentage in various groups (e.g. artistic, engineers). He intended the results to reveal introversive and extraversive types (essentially as Jung's types), also certain sub-types—coarted, retractive, ambi-equal—and the degree of intelligence

Recent examination, particularly that by Vernon,² Loosli-Usteri,³ and Oeser,⁴ shows marked inadequacy in these norms, poor reliability of the test as a whole (partly due to subjectivity of scoring), lack of scientific validation in claims made for the test, and other findings opposed to those of the author.⁵ Nevertheless, some of the qualitative results are of use in individual diagnosis.⁶ Shuey⁷ considers that it is a test merely of perceptual activity type.

Here we have the usual unfortunate result of launching a test which, lacking sound experimental and theoretical basis, is not so constructed as to be 'taken to pieces,' so that the parts which survive examination may be built up into other tests, in accordance with the advance of theory. A cut-and-dried test, based on the intuitive skill or self-deception of its author, invariably gains considerable attention in applied psychology, and much research is lavished on it which leads to no advances in theory such as might give rise to better tests. The same applies to the Downey Will Temperament Test, which we shall shortly discuss. Possibly the better qualification of applied psychologists would result in less dissipation of research time on tests having only an *ad hoc* purpose and remaining essentially unimprovable.

¹ *Psychodiagnostik*, Leipzig, 1921 (not available in English)

² P E Vernon, "The Rorschach Ink-blot Test I, II, and III," *Brit J Med Psychol*, xiii, 1933

³ M. Loosli-Usteri, "Les interprétations dans le test de Rorschach," *Arch de Psychol*, xvi, 1932

⁴ *Op. cit*

⁵ E g Loosli-Usteri finds kinæsthetic interpretations rare in children and associated with introversion and rigidity of thinking

⁶ For use with children see "Le test de Rorschach appliqué à différents groupes d'enfants de 10-13 ans," *Arch de Psychol*, xii, 1929

⁷ "A New Interpretation of the Rorschach Test," by H Shuey, *Psychol Rev*, xi, 1933

Kretschmer has used the Rorschach test for the diagnosis of schizothyme and cyclothyme types, principally by reason of the colour or form reactions, but also by other distinguishing reactions, notably: (1) schizothymes give more whole and fewer detail (part) associations; (2) cyclothymes give more object and scenery associations; schizothymes more people, faces, dancers, and fantasy associations. Oeser,¹ on the other hand, found colour-dominant people (presumably cyclothymes) to give more whole associations (fewer associations to detail).

Some of the experimental differentiations of cyclothymes and schizothymes outlined above have been flatly contradicted by other workers. But the most doubtful tests have not been included in our list. All the distinctions rest merely on differences of averages, not on correlations. Finally, the types themselves with which these test differences are said to connect have not been properly established. The cyclothyme-schizothyme difference is clearly not quite the same as the surgent-desurgent type distinction. (For example, cyclothymes, who give more colour associations, give fewer and slower associations all in all (Oeser), i.e. have not high 'fluency' of association as surgents have. Consequently, the whole thing is shot through with uncertainty.) Probably "schizothyme type" means desurgency, plus a certain kind of maladjustment (namely, deficiency of the 'a' factor above, p. 165), plus a high will factor.² All we know is that this complex can be to some extent measured by the battery of tests outlined above (p. 167), though different tests may be measuring different aspects or component factors.

(c) DOWNEY WILL-TEMPERAMENT TEST

As one of the first attempts to provide a relatively objective test of temperament, this test has deservedly

¹ Women, but particularly children, are more colour dominant, in perception and association, than men. Evidently, therefore, we are measuring partly a developmental will factor in these tests.

² O Oeser, "Some Experiments on the Abstraction of Form and Colour," *Brit. J. Psychol.*, xxii, 1932.

attracted considerable attention, but it will not be set out in full here as a useful routine test because, as the evidence discussed below clearly shows, it is somewhat less reliable than other tests of temperament and character that have been made available in this chapter. The full material (i.e. detailed instructions—no apparatus is necessary) is available in *The Will-Temperament and its Testing*, by June Downey, New York, 1923, obtainable from the World Book Company, Yonkers, N.Y., but there are no adequate norms.

It is a pencil and paper test (group and individual forms) consisting of twelve parts, all but three of which represent writing reactions, some of which are verbal and some non-verbal. The tests are scored on each of the under-mentioned twelve qualities.

The hypothesis behind these tests is that temperament is expressed in every movement. The theoretical conception of temperament types underlying the distinctions made is based on the explosive and obstructed types of William James. The sub-tests in each of the three sections are supposed to correlate highly with others in their own section, and each of the three sections is supposed to be related to the other, so that a high score on the test as a whole has a definite meaning, whilst the relative score on the three divisions has further diagnostic meaning. Downey found inter-correlation of the first set of sub-tests to range from .43 to .60, but of the other two sections—"aggressive" and "carefulness-persistence" traits—not so high.

SECTIONS AND SUB-TESTS OF THE DOWNEY TEST

1. *Speed and Fluidity of Reaction.*

- i. Speed of Movement.
- ii. Freedom from Load. (Ability to speed up and hold back.)
- iii. Flexibility.
- iv. Speed of Decision.

2. *Aggressive Qualities.*

- v. Motor Impulsion.
- vi. Reaction and Contradiction.
- vii. Resistance and Opposition.
- viii. Finality of Judgment.

3. *Carefulness and Persistence.*

- ix. Motor Inhibition.
- x. Interest in Detail.
- xi. Co-ordination of Impulse.
- xii. Volitional Perseveration.

Each of these sub-tests is scored out of a possible ten, and a Will-Profile is constructed on this basis. Actually twelve characteristics are scored on, and derived from, ten test results.

From the American inquiries one is forced to conclude that the test is of very little use with adults. With children it is of some slight diagnostic value with regard to the traits isolated by the sections, whilst the score on the test as a whole has a reliable correlation of .3 with examination success when intelligence differences are eliminated.

Consequently, it seems reasonable to predict that this test, for all its theoretical obscurities, would, in conjunction with an intelligence test, provide a useful empirical guide to a child's prospects of success in school work—a guide surpassing the intelligence test or the examination alone.

To apply it with children in other circumstances is not of great value, since we are not clear as to what the general factor (see evidence below) in the test is. Oates believes it to be "general emotionality," but it is equally possible, from its relation to speed of writing, that it is "fluency of association" (see p. 151), for the tests in the first of the three divisions are very similar to the tests evolved in fluency measurement. On the other hand, the tests involved in the last of the three divisions seem, on an *a priori* examination, to be testing 'w' (see p. 191). Thus, as a group test it might have some value in scholarship selection, but further investigation, particularly of the analytical kind undertaken by Oates, is necessary before it can give us evidence on temperament as such.

In this country the test has fared a little better than in the American enquiries ; Richardson¹ holds that the profiles have some value and that the test has some diagnostic value with children; Oates² found no group factors corresponding to each of the above three sections, but found a general factor in the majority of the tests which correlates very moderately with examination success (0.3), though it has no correlation with 'g.'

Kornhauser, on the other hand, with adults, found negligible correlations of every one of ten tests with estimates of temperament and will or with college performance; and Oates, in another investigation,³ found no general factor in the tests for adults nor any correspondence to ratings. May⁴ obtained correlations with ratings of 0.1 to 0.24. Detailed criticisms of considerable weight have been set out by Collins⁵ and by Vernon.⁶

2. Disposition

As stated at the opening of the chapter, the classification of dispositions is essentially the same as that of the instincts or propensities. Among these, the most powerful are the instincts of escape, of self-assertion and submission, of sex, of protection, of pugnacity, of gregariousness, etc., giving rise when any one predominates, respectively to a timid, assertive, submissive, amorous, kindly, irascible, or sociable disposition.

The researches so far made—from those of Galton on twins to those of Heymans and Wiersma on whole families—indicate a certain degree of inheritance of disposition, but these researches are based only on estimates of personality (not always adequately checked), and are, moreover, not capable of distinguishing between true inheritance and

¹ "A Non-verbal Will Temperament Test," *J Appl Psychol*, xi, 1927

² (a) "An Experimental Study of Temperament," *Brit J Psychol*, xix, 1928

(b) "Group Factors in Temperament Qualities," *Ibid*, xx, 1929

³ "An Investigation of some New Tests of Non-intelligence Qualities," *Forum Educ*, viii, 1930

⁴ "The Present Status of Will Temperament Testing," *J Appl Psychol*, ix, 1925

⁵ "Character and Temperament Tests," *Brit J Psychol*, xvi, 1925

⁶ "Tests of Temperament and Personality," *Brit J Psychol*, xx, 1929

the effects of early imitation through primitive passive sympathy.

Certainly many instances are known in clinical work of marked changes of disposition occurring even up to middle life, and the influence of health condition and of drugs is proverbial.

If we regard the instincts as drawing upon a common fund of libido, it follows that the strong development of one instinct (in frequency and intensity of functioning) must impoverish the remainder. Thus, e g, the assertive and irascible man would have less energy for curiosity, amorosness, and sociability, etc., and vice versa. The defining of a person's disposition, therefore, is a matter of determining which instincts are most developed.¹ Some kinds of disposition, e g. assertive and submissive, are in practice more important than others, notably in vocational guidance analysis. In any case no scheme or test assessing all the dispositions yet exists—nor would it be wise to work on one until more is known about disposition structure.²

TESTS AVAILABLE

Allport's Ascendancy-Submission Test. (A-5 Reaction Study.)—A series of 35 questions covering most of the situations in which assertiveness and submission readily show themselves, and requiring the subject to reply honestly (concerning his habitual response) by underlining one of three responses. One form for men; one form for women. About half an hour required.

¹ The notion of 'strength of instinct' is one which raises many theoretical difficulties, mainly because of the mutability of instinct energy described by Freud, and also because of the marked deflections and sublimations which the expression of any instinct can undergo. Nevertheless, in a rough practical way the notion has been very helpful, and attempts at measurement have not been unsuccessful. See e g. Colman and McCrae, "An Attempt to Measure the Strength of Instincts," *Forum Educ*, III, November 1927.

² Professor Burt, in discussing the nature of 'general emotionality,' has mooted the question as to whether group factors exist within it. Preliminary statistical work by the present writer on a large number of observations of emotional outbursts by young children suggests that at least two such group factors exist—those who are prone to self-assertion being also more pugnacious and gregarious, whilst those who are timid are also more affectionate, submissive, and protective. Disposition, therefore, may be more adequately described as the predominance of a group of instincts rather than, as McDougall suggests, of a single instinct.

Consistency Coefficient for students about $\cdot 75$.¹ Thirty items seemed more significant than the others and correlated $\cdot 97$ with the total test.² Validity on basis of ratings (college students) varies from $\cdot 29$ to $\cdot 79$. Those indicated as 'submissive' by test tend to do less well in academic performance.³

Material from Houghton Mifflin Co., Boston.

'*Projection Tests of Disposition*.'—These tests were designed by the present writer in an attempt to assess disposition by methods less direct, and requiring less co-operation from the subject, than in the Ascendancy-Submission test.

Tests for the six dispositions seemingly of most importance in vocational guidance and clinical work were worked out, as follows:

1. Assertive-submissive
Disposition.

{ without prejudice to the
theoretical possibility that
both instincts may be over-
developed in some indi-
viduals.

2. Acquisitive Disposition.
3. Gregarious Disposition.
4. Timid (cautious) (bold)
Disposition.
5. Curious Disposition.
6. Dependent (plaintive—
instinct of appeal)
Disposition.

Only 12 test items occur in each, since time does not usually permit giving more attention to disposition in routine testing, but the response to each item may receive one of three degrees of weight.

The principles underlying these tests could be applied equally to other fields of temperament-character assessment (see next chapter, p 229), and are as follows:

¹ G W Allport, "A Test for Ascendancy-Submission," *J Abn and Soc Psychol.*, xxiii, 1928

² Wang, *J Abn and Soc Psychol.*, 1931

³ M E. Broom, "A Study of a Test of Ascendancy-Submission," *J. Appl Psychol.*, xiv, 1930.

(1) In reading a story most persons will project themselves into it, so that if they are unexpectedly and suddenly asked to complete it, they will do so in the manner necessitated by their own emotional make-up.

(2) The story form is nevertheless unsuitable, since its parts are bound to be logically interdependent, so that the person who has responded at one point in a particular manner is constrained (according to his amount of intelligence) to respond in a concordant manner elsewhere. A series of independent statements of situations is therefore indicated.

(3) Where the motive, attitude, or disposition is such that a person might be expected to be aware that he possessed it, i.e. where people are likely to remark on it to the person concerned; where it is socially approved, part of the self-regarding sentiment and fully conscious, the person possessing a lot of it will tend to project that disposition on to his admired characters. Similarly, he will approve of any statement or generalisation which commends that psychological quality.

(4) Where the motive, attitude, or disposition is unconscious, because disreputable, the person with a large measure of it will tend to perceive it in the motives of people of whom he disapproves, or in any deliberately hidden motive.

(5) Nevertheless, even apart from these special conditions, some projection of one's own mentality will necessarily take place whenever the nature of some obscure motive has to be inferred or some impulse predicted.

(6) The test will be more effective, especially with more intelligent people, if the motive is implicit in the subject's choice rather than explicitly recognisable; ideally, it should be twice or thrice removed (by steps of inference) from the given statement.

(7) It is necessary to avoid items in which habitual conventional responses would occur, or in which the motive could be arrived at purely by the use of intelligence or in which psychological experience and observation would infallibly point to a certain choice.

The tests below have been successfully employed with 13- and 14-year-old children and with adults. They can be given either to individuals or to groups. The norms for males and females are distinct.

Since a conscious realisation of the purpose of the test would impair or at least alter the scores obtained, it is not labelled (when administering) with the name of any disposition (as is done for clarity here), but is presented as a "Judgment of Reason Test." More sophisticated or intelligent people might even then perceive the plan and intention of the test from the similarity of motive in all twelve questions on the same paper. To avoid this one might insert an equal number of varied 'buffer' items of no value. But this would waste the time both of examiner and examinee. Consequently, we have adopted the practice of giving disposition tests always in batches of three, the questions concerning the three dispositions being intermingled. Thus the first set is composed of Assertion, Acquisition, Gregariousness, and the questions follow in a cycle in that order. The second set is Cautiousness, Inquisitiveness, Dependence.

The sets made up in this manner are presented under the above heading with instructions as follows:

SET I

Instructions.—"In each of the following statements you have to underline *one* of the alternatives given. There is often little to choose between the alternatives, but always choose that which seems to you the most common-sense motive or reason. If a person, e.g. John, is described, assume that he is of the same age as yourself unless otherwise stated.

You will be given a very limited time for each item, so that you must underline one alternative *immediately* you have read them through. If you have not already done this when "Next!" is called, you must do so instantly."

Twelve seconds is allowed for reading and underlining each item. This means that the test must be done hur-

riedly. According to our preliminary experiments, the revelation of temperament is more marked when time for second thoughts is not given.

Assertive, Submissive Disposition

(Instincts of Self-assertion (Display) and Self-submission)

The numbers on the left indicate the order in which the questions should occur in the combined presentation, i.e. with the other two dispositions.

1. (1) John strained every nerve to beat the others
because { he was determined to be top. 2
his father wished him to succeed. 1
he needed the scholarship. 0
4. (2) A good deal of the trouble in life arises from
too much { love of pleasure. 0
love of power. 2
quarrelsomeness. 1
7. (3) At tea the admiral was the most important
person present and { tried 1
John { soon managed 2 } to go
was scared 0
up and speak to him.
10. (4) The food brought by the waiter was so bad
that, although everyone was looking at him,
John said { "Take it back, and send
the manager to me." 2
"I can't eat it." 0
"I'll have something different." 1
13. (5) A man sometimes makes witty remarks in
company because he
{ feels in a playful mood. 0
thinks the company is dull. 1
wants to show off. 2

16. (6) The new-comer pushed ahead of him in the queue, but because he was a reasonable man
 he merely { gave him a contemptuous glance. 1
 said "That's hardly fair." 2
 took it quietly. 0
19. (7) When arguing with an older and more experienced person to insist that you are right when you know that you are right is
 { rather conceited. 1
 natural. 2
 rather inconsiderate. 0
22. (8) When John found that he had to walk between rows of staring people in his new carnival dress he { enjoyed it immensely. 2
 was rather embarrassed. 1
 felt hot all over. 0
25. (9) To try to force one's opinion on others is sometimes { necessary. 2
 rude. 0
 a brave action. 1
28. (10) After the Head Master corrected him for keeping the ball to himself, he ceased to speak to anyone, feeling very { ashamed. 0
 insulted. 2
 'fed up.' 1
31. (11) The good business man is he who knows how { in their proper place. 2
 to keep his assistants { with their noses to the grindstone. 1
 doing work they like. 0
34. (12) A man who doesn't like being contradicted is usually { very sensitive. 0
 careful what he says. 1
 obstinate. 2

20. (7) Mr. Smith's desk was always full of papers because he
 { was naturally untidy. 0
 { hated throwing anything away. 2
 { liked to look busy. 1
23. (8) Many a man goes on and on in business because he is at heart
 { uninterested in anything else. 0
 { a miser. 2
 { a fighter. 1
26. (9) Which is the truest proverb?
 { A bird in the hand is worth two in the bush. 2
 { More haste less speed. 0
 { A stitch in time saves nine. 1
29. (10) One of the greatest causes of crime is the desire to have
 { a good time. 0
 { what belongs to someone else. 2
 { one's own way constantly. 1
32. (11) Although John was fond of the cinema he didn't go very often because he
 { had no one to go with. 1
 { hated the stuffy atmosphere. 0
 { wanted to save his money. 2
35. (12) Nothing is quite so irritating to watch as
 { unnecessary waste. 2
 { work badly done. 1
 { unfair play. 0

Gregarious Disposition

3. (1) Solitude is good { for nobody. 2
 { as a punishment. 1
 { for everybody. 0

6. (2) To say that a good film or football match is not so enjoyable if there are only a few people present is { only common sense. 2
a popular delusion. 0
reasonable. 1
9. (3) When Mary was ill she missed most of all { the company of her friends. 2
her long country walks. 0
her visits to the cinema. 1
12. (4) As the party grew noisier and jollier still John's one wish was to { have all his friends there. 2
leave at once. 0
find a quiet corner. 1
15. (5) We live in a busy age, but most people want to spend at least one of their free evenings a week { at a cinema or dance. 2
at a lecture. 1
with a book or making something. 0
18. (6) John was glad to get back to school because holidays on the farm were so { lonely. 2
smelly and muddy. 0
lacking in interest. 1
21. (7) A dog may be said to be more human than a cat, because it is more { clever. 0
sociable. 2
dependent. 1
24. (8) To hold opinions different from those of one's friends shows that at any rate one has { character. 2
thought intelligently. 1
originality. 0

27. (9) Boarding schools are better than day schools
in this respect; that they
- { make one sociable. 2
 - { supervise one's 'homework.' 0
 - { are generally in the country. 1
30. (10) John at length went out into the next room to
read because he wanted to
- { be quiet. 0
 - { show people what he had drawn. 1
 - { have some cheerful company. 2
33. (11) A person who doesn't belong to some club or
circle of companions is
- { wasting his life. 1
 - { missing recreation. 2
 - { generally doing useful work
elsewhere. 0
36. (12) The thing that hurt John more than anything
else was that
- { they stopped his pocket money. 0
 - { he was called an 'outsider.' 2
 - { Harry wouldn't speak to him. 1

SET 2

Cautious or Bold Disposition

Numbers on left indicate order in combined presentation of Set 2 disposition tests.

1. (1) The leader said it was too late to climb the
mountain wall, but really he was
- { thinking of his tired followers. 0
 - { nervous about it. 2
 - { feeling giddy. 1
4. (2) Intelligent people sometimes stay away from a
circus because they are afraid that the wild
animals will
- { be cruelly treated. 0
 - { escape into the audience. 2
 - { hurt their trainers. 1

7. (3) John $\left\{ \begin{array}{l} (a) \text{ loved} \\ (b) \text{ hated} \end{array} \right\}$ to be in the midst of thunder
and lightning because it
was $\left\{ \begin{array}{l} (c) \text{ so difficult to find safe cover.} \\ (d) \text{ grand.} \end{array} \right.$
 $a + d = 0.$
 $a + c = 1.$
 $b + c = 2.$
10. (4) To admire a person who will never take a risk
unnecessarily is $\left\{ \begin{array}{l} \text{very sound. } 2 \\ \text{ridiculous. } 1 \\ \text{unusual. } 0 \end{array} \right.$
13. (5) It is wise to approach a strange dog
 $\left\{ \begin{array}{l} \text{only when you can't avoid it } 2 \\ \text{cautiously. } 1 \\ \text{in a determined way } 0 \end{array} \right.$
16. (6) John thought ghost stories
were $\left\{ \begin{array}{l} (a) \text{ thrilling} \\ (b) \text{ silly} \end{array} \right\}$ but he preferred
reading them $\left\{ \begin{array}{l} (c) \text{ to crime stories.} \\ (d) \text{ not late at night.} \end{array} \right.$
 $a + d = 2.$
 $b + d = 1.$
 $c + b = 0.$
19. (7) It seems true to say that the lives of most wild
animals are governed by $\left\{ \begin{array}{l} \text{food supply. } 0 \\ \text{fear. } 2 \\ \text{aggression. } 1 \end{array} \right.$
22. (8) John preferred to travel by aeroplane because
he said it was really $\left\{ \begin{array}{l} \text{quite safe. } 1 \\ \text{most exciting. } 2 \\ \text{full of interest. } 0 \end{array} \right.$
25. (9) To explore a strange cave or ruined building
in a very lonely spot may be adventurous,
but it is also $\left\{ \begin{array}{l} \text{dangerous. } 2 \\ \text{interesting. } 0 \\ \text{instructive. } 1 \end{array} \right.$

28. (10) John thought he was going to die, but he managed to put away all
 { anxiety. 2
 { self pity. 0
 { thoughts of death. 1
31. (11) In many remote foreign countries it is still advisable and necessary to go about
 { with a guide. 1
 { armed. 2
 { prepared to sleep in the open. 0
34. (12) John became a very enterprising and 'go ahead' young man, though as a child he had always been rather
 { stupid. 1
 { timid. 2
 { dependent. 0
- 37 (13) As speed in traffic or machinery increases life is bound to become more
 { exciting. 1
 { wearisome. 0
 { dangerous. 2
40. (14) To walk past a notice that says 'Trespassers will be Prosecuted' is
 { asking for trouble. 1
 { sometimes permissible. 0
 { foolhardy. 2

Inquisitive Disposition (Set 2, continued)
 (Instinct of Curiosity)

2. (1) The Head Master never punished boys for smoking their first cigarettes because, he said, they are
 { only curious to see what it is like. 2
 { sure to be sick. 0
 { only trying to be grown-up. 1
- 5 (2) The letters which interested the office boy most of all were those marked
 { "strictly private." 2
 { with foreign postmarks. 0
 { "twopence to pay." 1

32. (11) The Brown family were not much liked in Littleton because they
- | | | |
|--|---|--|
| | { | refused to tell anything about themselves. 2 |
| | { | kept several dogs. 0 |
| | { | came from another county. 1 |
35. (12) When John had an evening alone he liked best of all to
- | | | |
|--|---|-------------------------------|
| | { | read a mystery story. 2 |
| | { | paint pictures 0 |
| | { | take his bicycle to pieces. 1 |

Dependent, Plaintive, Disposition (Set 2, continued)

(Instinct of Appeal)

3. (1) To ask advice of other people instead of trying to do something yourself is
- | | | |
|--|---|----------------------------|
| | { | natural. 2 |
| | { | generally sensible. 1 |
| | { | generally just weakness. 0 |
6. (2) If a small boy waits for his big brother to go home with him it is usually because he wants
- | | | |
|--|---|--------------------------------|
| | { | someone to talk to. 1 |
| | { | his protection. 2 |
| | { | to show off his big brother. 0 |
9. (3) John was very near tears because
- | | | |
|--|---|-------------------------------------|
| | { | he saw his mother going away. 2 |
| | { | he felt sorry for the dying bird. 0 |
| | { | his broken leg was so painful. 1 |
12. (4) Many a child likes better to go out with grown-up people because boys and girls
- | | | |
|--|---|---------------------------------------|
| | { | don't talk so interestingly. 0 |
| | { | do so much teasing and bullying. 2 |
| | { | can't help one across streets, etc. 1 |

- 15 (5) John lost his way completely in the dark and, thinking he would never get home that night, he was overcome with
- $$\left\{ \begin{array}{l} \text{a sense of his own stupidity. } 0 \\ \text{temper. } 1 \\ \text{despair. } 2 \end{array} \right.$$
18. (6) One of the most beautiful conceptions of God is that He is a person
- $$\left\{ \begin{array}{l} \text{to whom one can turn in trouble. } 2 \\ \text{of infinite wisdom. } 1 \\ \text{who created the universe. } 0 \end{array} \right.$$
21. (7) A sensible child plays $\left\{ \begin{array}{l} (a) \text{ near} \\ (b) \text{ away from} \end{array} \right\}$ home,
- so that he is $\left\{ \begin{array}{l} (c) \text{ never far from help} \\ \text{if hurt.} \\ (d) \text{ able to play on his} \\ \text{own.} \end{array} \right.$
- $$\left[\begin{array}{l} \text{In } a + c = 2 \\ \text{scoring } b + d = 0 \\ \text{ } a + d = 1 \end{array} \right]$$
- 24 (8) When John was hurt, he always wanted
- $$\text{to } \left\{ \begin{array}{l} \text{cry. } 1 \\ \text{be left alone. } 0 \\ \text{run to his parents. } 2 \end{array} \right.$$
27. (9) The child who brings his complaints to the teacher is really more sensible than one
- $$\text{who } \left\{ \begin{array}{l} \text{defends his rights with his fists. } 2 \\ \text{cries to himself. } 0 \\ \text{gives in quietly to bullies. } 1 \end{array} \right.$$
30. (10) When John found himself in the desert he was pleased to see
- $$\left\{ \begin{array}{l} \text{a guard of British soldiers. } 2 \\ \text{an oasis, with tents. } 1 \\ \text{signs of the people he was tracking. } 0 \end{array} \right.$$
33. (11) To call a doctor in, even though he does nothing is
- $$\left\{ \begin{array}{l} \text{better than waiting. } 0 \\ \text{reassuring. } 2 \\ \text{becoming more usual. } 1 \end{array} \right.$$

- 36 (12) The part of the play which affected John most
uncomfortably was where a young man
was { drowning miles from shore. 1
fighting against odds. 2
stealing his father's money. 0

Afterwards the test may be scored for any one disposition by taking the 1st, 4th, 7th items, etc., or for each of the three dispositions by separating out the three sets of items after scoring. The score on each item may be 0, 1, or 2 points, and is indicated by the numbers on the right. In some instances, though one alternative definitely implies strong projection of a certain motive (scored 2) and one does not (scored 0), the third alternative (middle value, scored 1) cannot be devised to be with certainty a weaker projection of the same motive. For reasons of uniformity these have to be overlooked: every question has a middle value (score 1) alternative.

The decision regarding the particular alternatives which shall score highly is not given arbitrarily by the designer of the tests, but is worked out on a correlation method as follows. On the basis of the original *a priori* decision as to the alternatives to be weighed, a group of 90 persons was divided into a high, a middle, and a low-scoring group (on all twelve items of the disposition in question). Where there was any doubt as to the high-scoring alternative (and ultimately on every item) a decision was arrived at by referring to the choice made on that item by the high and low scorers on the test as a whole.

The self-consistency of each of these six disposition tests is satisfactory, both with adults and children, but the validity is poor. They will not, therefore, be standardised until further experiment has revealed ways of increasing their diagnostic dependability, and they are published here in the hope that other research workers will be stimulated to inquire into the usefulness of this type of test in many different types of situation.

CHAPTER VI

PROBES OF CHARACTER AND THE STRUCTURE OF EMOTIONAL ADJUSTMENT

1. Note on the Present Position of the Psychology of Character

THROUGHOUT the exposition of test administration in these chapters runs the assumption that the reader is familiar with the mass of psychological principles and hypotheses lying behind the tests. Some tests, notably intelligence and attainment tests, can be reliably administered by people having only minor psychological qualifications, though even there the interpretation of results is bound to be less enlightened and far-reaching than in the hands of an experienced psychologist.

This statement applies *a fortiori* to assessments of temperament, character, and emotional adjustment. In earlier chapters the danger of inadequate or erroneous interpretation has been avoided by a brief exposition of the theoretical background of the tests. In the present chapter it is manifestly impossible to attempt any complete and succinct account of the necessary theory—so complex is the subject and so dissociated are the research approaches which attempt to elucidate it.¹

Some order may be introduced and practical convenience served by dividing the chapter into two studies. First the study and measurement of general integration and goodness of character, i e. of character as the teacher and the business man usually think of it. Second, the study of the quantitative and qualitative differences of character structure, of emotional adjustments, of neurotic and abnormal traits—in a word, of individuality.

¹ An excellent summary of the present state of the subject, alike from the experimental and the psycho-analytic standpoints, will be found in *The Psychology of Character*, by A A Roback (Kegan Paul).

2. General Integration and Stability of Character

In everyday life we are prone to speak of general goodness of character, but that is no guarantee that any such general unitary factor exists. Through inter-correlating carefully-controlled estimates, however, of a large number of temperament-character traits and ways of behaving among 200 students, Webb¹ discovered the existence of such a general factor of 'goodness of character.' This core of qualities included such traits as 'persistence of motive' and 'perseverance in the face of obstacles,' and might be said to have as its central feature 'consistency of action resulting from deliberate volition or will.' This, curiously enough, crystallises the common element in the assumptions that have been put forward by all manner of persons in all ages; they have recorded character as the power to resist whatever drives may be considered contrary to an accepted code, custom, or self-ideal.

Repeating this work under different, but equally controlled, conditions, the present writer confirmed the existence of this general factor, hereafter referred to by the symbol 'w' (for Will factor). The following are the characteristics which are of particular importance, ranged roughly in order of decreasing saturation with the general factor.

'w' QUALITIES

<i>Positive Traits</i> (Present with high 'w')	<i>Negative Traits</i> (Present with low 'w')
<p>★ <i>(Conscientious)</i> Essentially possessed of a strong conscience Trustworthy and reliable where morals enter into question Strong sense of moral duty and of right and wrong</p>	<p><i>(Unreliable)</i> Able to hoodwink his conscience Not entirely to be trusted in moral matters and in temptation</p>
<p>★ <i>Persistent</i> Activities and purposes naturally sustained Constant (not merely natural) vigour</p>	<p><i>Changeable</i> Takes up things and drops them again because of changes in interest Changeable by nature</p>
<p><i>(Persevering)</i> Consistency of action through direction of will Has persistent and unchanging motives, aims, and goals</p>	<p><i>(Wilfully Changeable)</i> Cannot be depended upon to persist in what he seems to have made up his mind to do</p>

¹ Webb, "Character and Intelligence," *Brit J Psychol*, *Monog Suppl*, No 3

Positive Traits

(Present with high 'w')

* *Energetic*

Free flow of energy Naturally industrious Naturally willing to work

* *Tactful*

Not necessarily gifted with ability to mix easily and get on with people, but always diplomatic, attentive to others feeling reactions, and able to make people comfortable in conversation

* *(Emotional Mood Steady)*

Shows a fairly even and constant emotional mood Not deflected for days at a time by phases Even flow of energy and even temper

* *Kind on Principle*

Is consistently kind, not on impulse or in form of occasional and excessive generosity, but constantly and in manifold ways as a part of his beliefs

Mature

Ready always to make a compromise between own wishes and those of others Able to forgo without fuss Does not overlook subjective life of others, their wishes, limitations, and individualities

Not Hedonistic

Indifferent to minor sensuous pleasures Not seeming to need them (chocolates, smoking) Even ascetic and self-denying where pleasures are concerned

Confident

Confident Solid without pretence or show of power Takes up life's responsibilities, naturally, without hesitation

Negative Traits

(Present with low 'w')

Inert

Poor flow of energy Apparently half-hearted Lame, lazy behaviour Tendency to avoid work, malingering, illness as excuse

Tactless

Makes inopportune remarks (not merely stupid) Offends people unintentionally Does not make others happy in conversation Ignores possibilities and others' viewpoint

Emotional Mood Oscillating)

Subject to fairly periodic oscillations of mood between gaiety and depression Affected powerfully by general moods, being depressed or excited and lively for days at a time

Not so

Absence of that general benevolence for others which is based on principle and belief in being merciful and kind

Wilful

Wilful, not able to swerve from his own desires and goals Demands (instinctive) satisfactions and upsets everybody if he doesn't get them Childish unwillingness to adapt and respond to external world

Sensuous

Constant craving for sensuous and sensual pleasures (not craving for excitement or comfort merely) Seeking solace in eating, smoking

Anxious

Fear of, and difficulty in, making decisions Procrastinative Afraid of responsibility Seeks positions of safety and security, flees from risks, and tries to avoid life's responsibilities Nerve fails at last moment

Any of the above pairs that are in brackets share some group factor with one or more of the non-bracketed qualities over and above the general factor 'w' common to all.

A. RATING SCALES

1. A Rating Scale for character, or indeed for anything whatever, is only of value if the contributory traits included have already been shown by research to possess some common factor underlying all of them, a factor moreover which is of distinct and widespread importance for the personality. Unfortunately, many carefully prepared and standardised rating scales have not been founded upon any such necessary preliminary research: they rate no single dimension of personality. A short rating scale for 'goodness of character' is readily provided by the foregoing list. The assessment should be made by raters on the starred items only (which ensures non-overlap). The total score is most simply arrived at by giving normal weight to each trait (though for special research purposes the first traits might be more heavily weighted).

To get unskilled estimators to give estimates which will result in a normal distribution of scores is notoriously difficult. If they are asked to use a five-point scale, A, B, C, D, E, they generally tend to make the average person fall at B instead of C. In most cases they also tend to use the extreme values too frequently. A useful corrective device consists in asking for estimates on a three-point scale, A, B, C, insisting on B being average, and permitting A + or C - to be used in rare instances (but no other pluses or minuses). Generally, a pretty good normal distribution will then result (i.e. values will be allotted roughly in the proportion of 1 A +, 4 A's, 6 B's, 4 C's, 1 C -). This permits one to give 1 point to C -, 2 to C, 3 to B, 4 to A, and 5 to A +, and so to add the points from each of the contributory traits to get a total score for 'goodness of character.' If the distribution is required to be perfect, the total scores can usually be quickly rescaled to a normal distribution.

The 'halo' effect—the failure to analyse out and assess each trait separately and the tendency to tinge every estimate with the colour of one's general approval or disapproval of the particular candidate—is best minimised by

a thorough discussion of the psychological roots of this tendency, by warning against it, and by arranging for the whole group to be estimated on one trait at a time (instead of assessing one person at a time on all the traits).

Then these precautions are taken, and when traits are defined in terms of various instances of specific behaviour instead of being left as a bald label with merely popular connotations, the consistency of ratings from a group of acquaintances of the person rated may rise as high as 0.7 or 0.8. The validity of a pooled estimate from two or three raters, on a single trait, when it can be checked against an objective test (as with 'intelligence') is, however, rarely found to exceed 0.7 or 0.8.

Recent work, as yet tentative and unconfirmed, would seem to indicate the existence of a group factor separating some of the above 'w' traits partially from the others with which they share the general factor. These traits are the 'energy' group—

Energy

Ambition

Persistence

standing out from the remainder, which might be called the 'inhibition-integration' group.

Other bases for rating scales are as follows:

2. *Rating Scale* (Porteus).—Porteus investigated the character-temperament traits of a certain class of defectives, viz., those whose intelligence alone would not have been poor enough to justify their retention in an Institution or cause them to require supervision. He found the following qualities fundamental: (i) lack of planning capacity; (ii) irresoluteness; (iii) nervousness; (iv) silliness; (v) suggestibility; (vi) impulsiveness; (vii) moodiness. ("A Study of Personality of Defectives with a Social Rating Scale.")

3. *Bridges' Rating Scale for the Social and Emotional Development in Pre-school children*—to be found on p. 232 of *Social and Emotional Development of Pre-School Child*, by K. B. Bridges, 1929.—It has fifty rating items, twenty-two on social

development, thirteen on personal development, fifteen on emotional development, and there are complete norms for boys and girls from 2 to 5 years. Choice of rating items, for inclusion in these categories, was not decided by a correlation method, but by observation of the traits which develop in close relationship to general maturity and adjustment in children over that age range. Based on a sound observational technique, the correlation of the total character score with Stanford Binet I.Q. varies between .2 and .5.

4. *Tjaden's Analytical Interview*.—A basis for a rating scale, but also for personal history, etc. 34 pages. For clinical purposes mainly. Too long for most purposes, but extremely comprehensive. Obtainable from Messrs. Stoelting.

5. *Personal Questionnaire*. (Jones).—Comprehensive, but partly comparable to a rating scale. For college students. Messrs. Stoelting.

6. *The North Carolina Rating Scale*.—Nine-point scale on 24 fundamental traits. Obtainable from Messrs. Stoelting.

7. *Willoughby Emotional Maturity Scale*.—Self-ratings on 60 traits. Messrs. Stoelting.

B. DIRECT TESTS

(i) *Miniature Situations*

The above researches on adults show that what might be regarded, *a priori*, as three distinct and independent aspects of character, namely:

(i) Integration (submission of impulses to some persistent purpose),

(ii) Tendency to moral and ethical behaviour,

(iii) Energy and forcefulness of character,

are, in fact, found to be pretty closely bound up by a common general factor. This is not the place to enter into any discussion of causes, but it seems relevant to point out that these connections may not be 'necessary' ones, and may be conditioned by the state of society; thus, e.g., bad societies might cause criminal 'ideals' to be associated with strength of character.

On the other hand, there are certain developmental reasons, mainly psycho-analytical, which would equally well explain the relatedness of these characteristics, apart from any such reflection of the integration of society.

In recent years, a variety of tests have been invented, chiefly in America,¹ to measure directly this general 'goodness' of character, largely by tackling the moral side, e.g. honesty, moral worth, trustworthiness. Hartshorne and May mention some 100 tests "either standardised or in the form of definite proposals," and attempt to classify them under the following headings according to technique:

- (1) The Order of Merit Method.
- (2) The Scale of Values Method.
- (3) The Multiple Choice Method.
- (4) The True/False Method.
- (5) The Cross-out Method.
- (6) The Distribution Method.
- (7) The Information Test Method.
- (8) The Comprehension Test Method.
- (9) The Recognition or Identification Method.
- (10) Performance Tests.
- (11) Association Test Method.
- (12) Physiological Method of Investigation.

They can also be divided:

- (a) Tests of ethical, moral, social, and religious discrimination or knowledge.
- (b) Questionnaires requiring self-revelation, regarding one's thoughts or habits, prejudices, etc.
- (c) Ratings and self-ratings on listed traits.
- (d) Tests by miniature situations.

The objections to the self-rating and questionnaire methods have already been discussed in the chapter on interests (p. 119), and ratings by others need to be subject to the controls set out above (p. 193).

Regarding (a) it is sufficient to point out that, though knowledge of what is the right thing to do is a necessary

¹ See résumé in Hartshorne and May, *Studies in Decent* (The Macmillan Co)

basis for right action, extremely few defective character responses arise from ignorance of more moral alternatives. Very occasionally, failure may arise from the latter cause, as, for example, when an adult who is quite honest in material matters will be quite dishonest in thought or reasoning through failing to perceive or to generalise that honesty, which for that particular adult is an accepted ideal, is also involved in the second (thought) situation.

Put to the touchstone of experiment, these discrimination tests are generally of little value, as Hartshorne and May have found. Knowledge of desirable courses of conduct did not imply the corresponding conduct, and in one instance with adults, though 84 per cent. of the group placed honesty at the head of the list of virtues, 40 per cent. cheated.¹ If these 'discrimination' tests correlate with goodness of character—and they do to a slight extent—it is largely because they are partly tests of intelligence, and intelligence, as Terman's work shows, correlates with goodness of character. Hartshorne and May found that in moral-knowledge tests children agree most of all with their parents, then with their friends, next with their club leaders, and least with their teachers.

In contrast to the 'ethical discrimination' examinations, the ingenious 'miniature situation' tests have proved, in the main, to be practicable, even if there is some slight objection in that they subject pupils to slightly more temptation than they would otherwise encounter in the normal course of school lives. In these tests the subject is given a task to perform under difficult conditions, with opportunities to cheat, the test being so arranged that, though cheating is apparently safe, it can be detected with certainty. Opportunities are also presented for the student in which he may take credit to himself unfairly, steal and receive help when he should be proceeding independently. With such tests, Hartshorne and May, curiously enough, concluded, after the most thorough work that has yet been

¹ Character Tests through Moral Ratings "A Critical Study in the Objective Measurement of Character," by F J Brown and M Sheldahl, *J Educ Res*, 1928, xviii, 290

carried out, that the notion of a general character factor described above cannot be said to hold for children, since a child who was quite honest in one test situation was not honest in another. They summed up: "The unselfishness, persistence or inhibition that characterised a child's behaviour was closely tied up with the situation calling it forth, and could not be made the basis of generalisation, about what would happen in all other situations."

Nevertheless, the contradiction is by no means absolute, since the theory of 'w' does not demand a perfect correlation between various situations. Traits listed under 'w' above are only partially saturated with 'w.' Secondly, as we have suggested when discussing moral discrimination above, the situation may not be perceived by the child as dishonesty, either through sheer blindness and lack of reasoning, or because the group ethics have labelled it otherwise. (In some schools it is notorious that the children's ethical code favours cheating.) Thirdly, the low inter-correlations may be due to an insufficient scatter and variation of character within the groups chosen. Fourthly, any given situation, though apparently standardised, may, in fact, mean something very different for each child, because it fits differently into his total conative life plan, e.g. passing an examination may be part of self-regard for one child, love of parents for another, and meaningless perspiration for a third.

This absence of complete correlation between tests of honesty, confidence, etc., in different situations has led to the viewpoint that it is incorrect to speak of a trait of honesty, confidence, etc. Such a conclusion by no means follows; see e.g. discussion by Allport and Vernon ("The Field of Personality," *Psychol. Bull.*, 1927, No. 30).

Again, as Hartshorne and May themselves discover, the standards and forms of honesty have different patterns according to the social groups from which the child comes, so that the disproving of a general ethical behaviour factor is not the disproving of a general soundness of character factor. With adults who have more uniform standards, at any rate, a much higher correlation might be expected.

Gardner Murphy records an average correlation of .22 between nine tests of honesty applied to children, but the reliability of the test as a whole was quite good (.73) and the inter-correlations increased markedly when a group with higher general character development was chosen.¹ This would seem to confirm the present writer's contention that Hartshorne and May's negative findings are explicable without modifying fundamentally the hypothesis of a general character factor 'w.'

An experiment by the present writer, in which similar miniature situation tests were tried with five children in a normal school and five children in a school for delinquent and difficult children, resulted in four of the latter cheating and only one of the former. Such an experiment with a mere handful of cases can be cited only as illustration and not as proof (of general soundness of character), but it suggests that, granted the situations are chosen so as to mean much the same for each child (raising the same kind of strength and urge), and provided the conflict is arranged to be between an innate or instinctive impulse and the general self-regarding sentiment, there is every reason to suppose that tests of this kind, if graded to an appropriate degree of difficulty, will give good inter-correlations, and will be found to be effective in measuring general soundness of character. Even tests already available are of sufficient validity to be used for limited purposes or under favourable conditions.

Tests Available

Gady's Measure of 'Incorrigibility.'—(1) Dotting circles or tracing mazes with the eyes shut. Temptation and opportunity to 'peep.'

(2) Willingness to cheat in scoring one's own intelligence test by writing in correct responses from key.

(3) Modesty and accuracy in statements about knowledge possessed.

(4) Moral judgment. Indication of degrees of blame

¹ *General Psychology*, by Gardner Murphy, p. 554

attaching to various moral defects (Modification of Pressey—see below).

(5) Modification of Woodworth Questionnaire (see below).

The consistency of these tests (with 150 12-14-year-old boys) was, respectively, .74, .58, .58, .38, .75. Total, .75. The agreement with ratings—in a group showing a very wide scatter (delinquent to highly reliable)—was respectively .40, .19, .41, .20-.31, .36-.42. Total, .58.

For details see V. S. Cady, "The Estimation of Juvenile Incurability," *J. of Delinquency*, Monograph No. 2 (Whittier, Calif.), 1923.

Voelker's Trustworthiness Test.—Ten tests of trustworthiness. Not all can be given to groups. Consistency of whole test, .75. Agreement with trustworthiness ratings, .60.

(1) Willingness to accept undeserved credit (overstatement test).

(2) Suggestibility (two tests from Downey Test).

(3) Tending to accept help in problems after promising to work alone.

(4) Conscientiousness in returning borrowed property.

(5) Dishonesty in accepting overchange.

(6) Willingness to accept a tip for a trifling courtesy.

(7) Trustworthiness in performing a routine task under temptation to neglect it. (Pushing button every two minutes.)

(8) The same with different material. (Cancelling A's in a book with attractive pictures.)

(9) Willingness to 'peep' when placed on one's honour to perform a task with the eyes closed.

(10) Willingness to cheat in serving one's own examination paper.

For details see P. F. Voelker, *The Functions of Ideals and Attitudes in Social Education*, Teachers' College Bureau of Publications, N.Y., 1921.

Raubenheimer's Tests.—An improvement on the original tests of Voelker, Cady, Knight, and others, from which they are derived.

(1) *Overstatement A.* (After Franzen.)—Fifty book titles, twenty of which are fictitious. "We want to see who has read the most books." Score on number of fictitious titles underlined.

(2) *Overstatement B.* (After Voelker.)—Part I, a statement of knowledge, e.g. "Do you know how to find the square root of decimals?" Very well, fairly well, not at all. Part II, a test of actual information on these matters. Score is per cent. of over- or under-statement.

(3) *Questionable Reading Preferences.*—A variety of book titles, e.g. "The Boy Inventor," "Roy Black," "The Master Thief," to be arranged according to reading preference. Score sum of squares of deviations from 'correct' order (desirable according to ethical standards).

(4) *Questionable Character Preferences.*—Eight boys described briefly, e.g. "Ray Stevens is at a school now, but he is anxious to get out. He wants to become a taxi-driver. Ray says that taxi-drivers have an easy time," etc. Asked to place them in order of desirability as chums.

Score as for (3).

(5) *Social Attitudes.*—Underlining attitudes to each of twenty-four things or ideas, e.g.

chums.—It is hard to go without them.

You cannot always trust them.

They sometimes squeal on you.

It is best to have them in your gang.

Score number of questionable statements among those underlined.

(6) *Activity Preferences,* e.g. Go camping with the Boy Scouts. Go around seeing the country, getting lifts as you go. Quit school and go with the circus.

(7) *Rating the Seriousness of Offences,* e.g. Sam set fire to the public school which he attended. Ted played hookey to go to a circus. Joe entered the house of the people next door and took \$2.50.

Score as for (3).

(8) *Intelligence Test (National).*—The consistency co-

efficients of these eight tests varied between $\cdot 74$ and $\cdot 86$. Tests 2, 5, 6, and 7 correlate more highly with intelligence than is desirable ($\cdot 49$ – $\cdot 64$), but there are positive inter-correlations between all the tests which are not entirely due to intelligence. Validity of the whole test, by correlating with estimates of reliability, stability, and healthy-mindedness, using bi-serial r , $\cdot 47$ – $\cdot 74$. Best validity on tests 2, 3, 5, and 6.

Terman Battery.—From preliminary research with the above tests, Terman selected the following battery on the grounds of effectiveness and freedom from objections from teachers on moral grounds:

- (1) Overstatement A (Knight-Raubenheimer).
- (2) Overstatement B (Voelker-Cady-Raubenheimer).
- (3) Reading Preferences (Raubenheimer).
- (4) Character Preferences (Raubenheimer).
- (5) Social Attitudes (Raubenheimer).
- (6) Trustworthiness in following directions (Voelker-Cady).
- (7) Questionnaire test of emotional instability (Woodworth Cady).

Instructions, material, and (American) norms for this battery will be found in *Genetic Studies of Genius*, by L. Terman, vol. I (Messrs. G. Harrap and Co.).

(ii) *Psychoneurotic Inventories, etc.*

Under this heading may be classified a number of personal inventories, 'cross-out' tests, and tests of emotional maturity in which the subject responds by underlining or replying to questions in a standard paper test. Most of the standardised interviews also come in this category.

In addition to being susceptible to that conscious and unconscious dishonesty, which Hollingworth has called the 'self halo' effect, and which has been discussed elsewhere (p. 193), they generally fail in that they give no measure of any single definite quality. The scores on a large number of items, often most diverse, are lumped together in a vague total measure. Or if they aim at assessing some general

quality or tendency—'psychoneurotic tendency,' 'personality,' 'emotional maturity'—it is couched in popular phraseology, has no precise meaning, and is not founded on any research indicating that any such unitary functional tendency actually exists. For example, the varieties of psychoneurotic make-up are legion; some neuroses are radically different from others—might indeed be said to be opposite modes of adjustment to others—and are completely different in significance. Yet the psychoneurotic inventories put mutually exclusive neurotic symptoms side by side, and compound a total score which is supposed to have some value.¹ The relation of score to intelligence has also not been sufficiently investigated.

These tests have been classified in the character stability test section, because in a general way neurotic symptoms may be said to imply unsatisfactory character integration. General emotionality, one of the tendencies frequently included in these inventories, definitely has a negative correlation with 'w' (about $-.5$ in the present writer's enquiry). A high score on these tests, therefore, though it may be difficult to interpret qualitatively, may be used to some extent as a quantitative measure of (low) 'w.'

The blurred impressions of personality which result from such tests, even if they were consistent, would be of little value for any conceivable purpose, and it is a great pity that many extensive investigations have been built on the crazy foundations of such 'tests.'² Nevertheless, there is much material in them which has been industriously gathered and ingeniously arranged, and which, if sifted by thorough and well-planned research, would yield worthwhile tests or, better still, research information about personality structure.

¹ One investigator, after making up a psychoneurotic inventory, in which he included many introvert traits, gave it to a large number of students, and after working out the scores statistically, concluded, "The neurotic tends to be more introverted"

² I pick up at random the *J Soc Psychol* (1934), and find an interestingly-planned research quite vitiated by the poorness of the instrument, but which does not hesitate to draw such important conclusions as that "Married women are more neurotic than married men, married persons are more neurotic than unmarried college students of the same social level" (R P Willoughby, using Thurstone Personality Schedule)

For the limited purpose of use with trained students, prepared to be unnaturally frank and honest for the sake of scientific research, these inventories might be employed effectively even as they stand. It has been considered worth while, therefore, to present here the following list of available tests.

Available Test Material

A Systematic Questionnaire for the Study of Personality. (F. H. Allport.)—Intended for personnel work and for study of emotional and nervous instability. One hundred and seventy-six questions under various headings, e.g. Character, attitude towards self and towards reality, sex and family life, developmental history. Would have considerable value in self-study, and as a basis for interviews. Messrs. Stoelting.

Bernreuter Personal Inventory—Four scales: Thurstone's 'Emotional Stability,' Allport's 'Ascendancy-Submission' (see Disposition Tests, p. 174), Laird's C Inventory (see Temperament Tests, p. 164), and Bernreuter's Self-Sufficiency Test compounded. The highest consistency is found with Thurstone's and Allport's tests. These four tests have high inter-correlation (averaging about .85) and correlate from .56 to .67, with direct self-ratings on the qualities concerned.¹ They, therefore, constitute a battery which, pending further investigations, may be regarded as the most valid yet devised among 'inventories.' It is doubtful, however, whether the total compounded score has meaning purely as 'soundness of character.'

Brotlemarkle Comparison Test.—A test with seven pairs of word-opposites between which various other given words have to be arranged in order. Also the same material is repeated from the point of view of emotional reactions and associations to the words (as in Pressey, below). A short test, but doubtful in aim and method. Brotlemarkle found

¹ "The Validity of the Personality Inventory," by R. G. Bernreuter, *Personnel J.*, xi, 1933

no correlation of Pressey and Downey with this test or with each other.¹ Blanks and norms from Messrs. Stoelting.

Davis's Personal Problems Test.—For revealing dread and anxiety situations. Messrs. Stoelting.

Fernald's Ethical Discrimination Test.—An early paper test on moral knowledge lines. (See G. G. Fernald, "The Defective Delinquent Class: Differentiating Tests," *Amer. J. Insanity*, lxxiii, 1912.)

Pressey's X-O for Investigating the Emotions.—A group test. Its methods are ingenious and objective, but it is not founded on any fundamental research into personality structure. It has two aims: (1) to give a general measure of emotionality and of deviation from normal emotional make-up; (2) to probe particular complexes and affective attitudes, as Jung's test does (see p. 246). It is for the first purpose that it has been most employed, and for that reason it is included here rather than in a later section.

There are four tests, each on a separate blank of a four-page folder. The first consists of twenty-five sets of words, e.g. disgust, fear, sex, suspicion, aunt, on each of which one crosses out all the words that impress one as unpleasant. The second is twenty-five sets of words, e.g. BATH: naked, choke, tree, alone, danger, in which one crosses out all words that seem associated with the first word in the line. The third is twenty-five sets of words, in which one crosses out all the words that mean something wrong or something to be ashamed of. The last is twenty-five sets, in which one crosses out anything that has caused one worry, nervousness, or dread. Finally, all lists are run through again, encircling words, one in each set, about which one has worried. The working time for the average subject is about 30 minutes.

The scoring takes account of (1) whether the number of words crossed out is normal or unusually great or small; (2) the deviations from the normal choice of words;

¹ *Challenging Three Standardised Emotional Tests for Validity and Employability*, by D. R. Gorham and R. A. Brotlemarkle

(3) the particular directions of worry, associations, and attitudes. From these, by reference to given norms, a measure of emotionality, etc., may be obtained. How far this is valid is unknown. Flugel and Radclyffe¹ found zero correlation with a direct questionnaire on the same subject, and a consistency of 0.7. McGeoch and Whitely² found a consistency coefficient of .84 for affectivity (emotionality), but decreasing markedly as the interval between testings increased from 2 to 90 days. The 'idiosyncrasy' reliability was lower. Broom³ found low consistency and negligible correlations of total score with estimates by others.

There is a B form of the test, shortened to three blanks, simplified and expurgated for use in schools. Material from Messrs. Stoelting. It is chiefly in the analytical field that this test is recommendable (see p. 227).

Thurstone's Neurotic Inventory. (S. L. Thurstone and F. G. Thurstone.⁴)—Like the other inventories, it is an 'omnibus' type of test, compounding all manner of questions which the authors believe, on rough observational grounds, to be associated together in a 'neurotic constitution.' In this Personal Schedule there are 223 questions which have mostly been taken from questionnaires by Woodworth, Hoare, Laird, Freyd, and Allport. G. W. Allport has shown,⁵ like Bernreuter (see above), that this measure correlates positively (but not highly) with (1) measures of introversion; (2) low scores on the A-S test, and (3) lack of drive. He concludes that they may all be measuring in common the 'w' factor (to be precise, deficiency thereof) of character, and with this the present writer is inclined to agree. Material in Thurstone's article above; norms also in Allport's article.

¹ J C Flugel and E J Radclyffe, "The Pressey Cross-out Test compared with a Questionnaire," *Brit J Med Psychol*, viii, 1928

² "The Reliability of the Pressey X-O Tests for Investigating the Emotions," *Ped. Sem*, xxxiv, 1927

³ M E Broom, "Note on the Validity and Reliability of the Total Scores yielded by the Pressey X-O Tests of the Emotions," *J Appl Psychol*, xvi, 1932

⁴ "A Neurotic Inventory," *J. Soc Psychol*, 1, No 3, 30, 1930

⁵ "The Neurotic Personality and Traits of Self-Expression," by G W Allport, *J Soc. Psychol*, 1, 1930.

Woodworth's Psychoneurotic Inventory (originally "Personal Data Sheet").—Modified by Matthews¹ and later by House to the Woodworth-House Mental Hygiene Inventory. Contains 100 questions bearing on symptoms of mental disorder. Self-consistency pretty high. It is of value in self-study and as a general guide to personality among students trained in psychological methods, but does not appear to be a consistent or valid test of emotional balance.² Material from Messrs. Stoelting. An abridged form of the inventory (75 questions) is available.

C. INDIRECT TESTS CONCERNING TYPE OF CHARACTER INTEGRATION

(There are at least two tests to-day which, through unexpected connections revealed by research, offer exceptionally good objective measurements of the general type of, and soundness of, character integration. In both of these tests, described below, there is, however, a good deal that is still obscure, preventing complete interpretation.

(i) *Perseveration Tests*

The researches of Pinard³ first showed that perseveration is related to character, and the finding has been confirmed by the present writer.⁴ It appears that both very high and very low perseverators are prone to be unreliable and difficult; the best characters, on the other hand, are medium perseverators. Such a relationship is found both among people all of relatively good character and among groups containing chronically delinquent and problem children. Very high perseverators are, on the whole, worse than very low perseverators, the relationship of perseveration ('p') and character 'w' being as shown below.⁵

¹ "The Validity of the Matthews Revision of the Woodworth Personal Data Questionnaire," by E. G. Fleming and C. W. Fleming, *J. Abn. and Soc. Psychol.*

² *Op. cit.*

³ J. W. Pinard, "Tests of Perseveration, I—Their Relation to Character," *Brit. J. Psychol.*, xxii, 5, 1932

⁴ R. B. Cattell, "Temperament Tests—II, Tests," *Brit. J. Psychol.*, xxiv, 1, 1933

⁵ This non-linear relationship actually gives a linear correlation of about $-.3$ between 'p' and 'w'

Beyond this one steps into regions of unconfirmed researches, and this is particularly true with regard to the differences which distinguish the character weaknesses of high perseverators from those of low. Though character

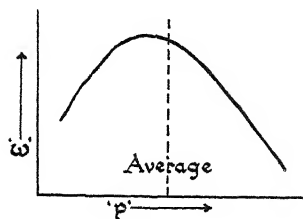


FIG. 56.

abnormality is associated with extreme 'p' scores, extreme 'p' scores are not invariably associated with poor character, and occasionally very low perseverators are pointed out as being of outstanding dependable character. Stephenson¹ and Pinard² found extremely low 'p' scores

among 'manic' and 'hysteric' patients in a mental hospital, and extremely high 'p' scores among melancholiacs and dementia præcox cases (and to some extent with those unduly sensitive, suspicious, paranoid, or obsessional). These tests, therefore, have diagnostic value in determining the nature of such extreme forms of personality disintegration. Stephenson³ has further shown that among high p-præcox cases the 'p' score becomes higher and higher with decreasing accessibility and lower in the rarer instances of remission or recovery, thereby acting as a kind of thermometer of præcox condition. In conclusion, one can say that a high 'p' score is almost certainly an indication of low 'w' and disintegrated character; a low 'p' score may indicate either an erratic character or, occasionally, a very firm character of a certain brittle nature, a medium 'p' score is almost invariably associated with good 'w.' The differences which can be said, with some confidence, to distinguish the character of abnormalities of high perseverators from those of low are set out below. These are derived from three independent

¹ W. Stephenson, "Studies in Experimental Psychiatry—Some Contact of p-factor with Psychiatry," *J. Mental Sci.*, lxxviii, 1932

² J. W. Pinard, "Tests of Perseveration—II, Their Relation to Certain Psychopathic Conditions and to Introversion," *Brit. J. Psychol.*, xxiii, 1932.

³ W. Stephenson, "Studies in Experimental Psychiatry—III, p-score and Inhibition for High p-Præcox Cases," *J. Mental Sci.*, lxxviii, 1932

researches¹ on normal children and adults, in addition to Stephenson's work with psychotics described above.

The aim of 'p' tests, therefore, is not merely to measure the level of 'w,' but also to indicate the type of character integration—roughly speaking, whether it is one prone to hysteric or to neurasthenic breakdowns. Since psychopathology still entertains conflicting theories as to whether the hysteric-neurasthenic difference is due to environmental (historical, structure) factors or to constitutional temperament, perseveration tests may be regarded partly as tests of temperament.

CHARACTERISTICS OF

<i>Low Perseverators</i>	<i>High Perseverators</i>
Prone to action in dissatisfaction. Masterful; active	Resigned, but often seeking expression in tortuous ways—hence sometimes de- ceitful, cruel, spiteful, unpredictable
Insistently assertive High tension Hence nagging, restless, fussy	Quiet, slow, more emotional and 'deep' in general
Enterprising, self-reliant Sometimes naively individualistic Tend to be natural leaders	More sceptical and pessimistic Con- servative in habits
Not affected by emotional scenes Inconsiderate, tough	Sensitive
Irritable, selfish, silent, and anxious ²	Rebellious in outlook, serious, shy and solitary ²
Tends to be interested in mechanical, scientific, and mathematical matters	Tends to be interested in history, languages, and humanities
Decisive and impetuous Ability to grasp situations whole Good taste and definite style in dress, voice, music, etc	Absent-minded Impressed by one thing at a time Drifting to decisions. Dreamy Sentimental Careless of de- tail Slovenly in dress
Dreams very little.	Greater tendency to dreaming (in sleep)
Liable to short periods of acute rest- lessness and crises of intense emotional dissatisfaction.	Liable to long periods of depression or gentle melancholy

¹ R. B. Cattell, "Temperament Tests II," *Brit J. Psychol*, xxiv, 1933, also "Perseveration and Personality—Some Experiments and an Hypothesis," *J. Mental Sci*, lxxx, 1935, J. W. Pinard, "Tests of Perseveration—I, Their Relation to Character," *Brit. J. Psychol*, xxiii, 1932

² This distinction from J. W. Pinard's work in "Tests of Perseveration—I, Their Relation to Certain Psychopathic Conditions and to Introversion," *Brit J. Psychol*, xxiii, 1932, the others from sources given above

Low Perseverators

More interested in scientific, business, and practical matters

Makes good use of relatively low I Q (In social status, responsibility of occupation, etc)

In general character is defective because of 'immaturity' *naïveté* and lack of adequate inhibition

High Perseverators

More interested in religious, historical, and language subjects
Neurotic symptoms of a general nature more prevalent

Fails to make good use of intelligence in any ordinary sense

In general character is defective because of excessive deep inhibition with general discouragement and lack of integrated driving power

When interpreting 'p' score, the following additional factors must be taken into account. There are apparently inborn differences of perseveration since intra-familial correlations ($\cdot 3$ – $\cdot 4$ between brothers) have been found, and since there are significant racial differences—the darker Mediterranean and Jewish groups being higher in perseveration than typical Nordics and Anglo-Saxons.¹ Hence perseveration must be to some extent interpreted relative to the average for the racial type.

On the other hand, some part of 'p' score must be regarded as indicative of a temporary state rather than a permanent element of personality. Such variation probably accounts for some of the apparent low consistency of 'p' tests. The present writer finds that delinquent children having very high 'p' scores when first referred come to have moderately low 'p' scores after successful emotional adjustment has been brought about. 'p'-score, moreover, increases in states of illness and fatigue.¹

High perseveration is also associated with the following history: (1) frequency of illness and delicacy in early childhood; (2) being spoilt or brought up very laxly; (3) being the youngest child of a family; (4) being brought up in poorer families.²

Perseveration, as measured by sensori-motor tests—the 'p' factor—is not necessarily connected with all forms of observed and introspected psychiatric 'perseveration'

¹ R. B. Cattell, "On the Measurement of Perseveration," *Brit J Educ Psychol.*, v, 1, 1935

² R. B. Cattell, "Perseveration and Personality," *op cit*

(e.g. of ideas, melodies, intentions, feelings). Most forms of perseveration, persistence of sensations, melodies, moods, and all forms of absent-mindedness are connected with high 'p' score, but all 'perseverations' associated with intention, e.g. inability to drop a conversation or turn to new tasks, seem to be associated with high 'w' and with moderate 'p' (see pp. 192 and 208) rather than with high 'p' score, whilst other perseveration (e.g. echolalia in imbeciles) is a matter of low 'g.'

Technique of Testing.—Because of the fatigue effect mentioned above, it is desirable to test subjects always at about the same time of day. The norms below are for the late morning session (say 10.30–1 p.m.). The main problem in designing 'p' tests has been to eliminate correlations with intelligence (dull persons tending to high perseveration when their perseveration was in fact normal) and with speed. The following tests¹ and their manner of scoring eliminate these correlations almost completely.

Two principles of construction may be employed in perseveration tests: (1) creative principle—perseveration shown by relative inability to reassemble elements of an old habit in a new way, and (2) alternation principle—perseveration shown by slowing down when too well-established habits are made to alternate rapidly.

In both types of test (also in tests combining both principles) 'p' is measured by dividing (or otherwise contrasting) the score on the natural, unimpeded part (hereinafter called X performance) by the score on the impeded (creative or alternating) part (hereinafter called the Y performance or activity).

Creative-type tests correlate rather more highly with the general 'p' factor, but one test of this kind cannot be used again and again with the same person, whereas the alternating test can, with a slight alteration of norms.

Few 'p' tests correlate with the general factor

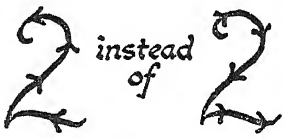
¹ R. B. Cattell, "On the Measurement of Perseveration," *Brit J Educ Psychol*, v, 1, 1935.

more than .3-.4; consequently, for a reliable 'p' measurement, one must pool the scores of quite a number of sub-tests. In general, 'p' testing requires considerably more skill and care than, for example, intelligence testing.

The following six tests have proved suitable for adults. Their 'p' saturation decreases from tests 1 to 6.

Apparatus: Sharp pencil and sheet of lined paper. For procedure, see end of tests.

1. *Reverse Stroke* (alternating and creative)

X Activity	(1)	234, 234, 234, written normally—for 15 seconds			
	(2)	234, 234, 234, etc., each figure begun at the opposite end from the usual one, thus		Hereafter called Reversed stroke.	15 seconds
	(3)	234, 234, etc, written normally			15 seconds
	(4)	234, 234, etc (Reversed stroke)			15 seconds
Y Activity	(5)	234 written as in (1) and (3) above, alternating with 234 written with reversed stroke			15 seconds
	(6)	The same as (5)			15 seconds
	(7)	The same as (5)			15 seconds
	(8)	The same as (5)			15 seconds
$P \text{ score} = \frac{\text{Total number of figures in first four rows (X)}}{\text{Total number of figures in last four rows (Y)}}$					
Errors are omitted from the totals.					

2. *Alphabets*

X Activity	(1)	abcd, abcd, etc (i e written small and cursive)	15 seconds
	(2)	ABCD, ABCD, etc (i e block capitals)	15 seconds
	(3)	abcd, abcd, etc, as in (1)	15 seconds
	(4)	ABCD, ABCD, etc, as in (2)	15 seconds
Y Activity	(5)	aAbBcCdD, aAbBcCdD, etc, i e letters alternating	15 seconds
	(6)	The same	15 seconds
	(7)	The same	15 seconds
	(8)	The same	15 seconds
$P \text{ score} = \frac{\text{Number of letters in X}}{\text{Number of letters in Y (errors omitted)}}$			

3. *Perseverameter*

For this a piece of simple apparatus is needed, consisting of six typewriter-like keys in two banks of three, as shown below. Each key has a different trajectory (varying from $1\frac{1}{2}$ to $\frac{1}{3}$ inch) and a different spring resistance (which is,

however, very light in all cases). It may be fitted with a counting mechanism to facilitate scoring.

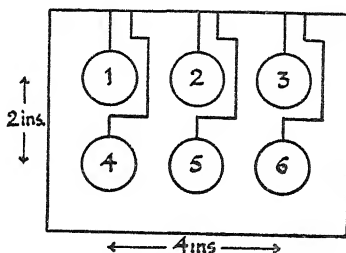


FIG 57—Plan of Perseverameter

The subject is asked to tap the keys lightly in the following order:

- | | | |
|---------------------------------|------------|--------------|
| (1) 2346, 2346, etc | 15 seconds | } X Activity |
| (2) 2561, 2561, etc | 15 seconds | |
| (3) 2346, 2346, etc | 15 seconds | |
| (4) 2561, 2561, etc | 15 seconds | |
| (5) 2346, 2561, 2346, 2561, etc | 15 seconds | } Y Activity |
| (6) The same | 15 seconds | |
| (7) The same | 15 seconds | |
| (8) The same | 15 seconds | |

$$\text{Score} = \frac{\text{Number of cycles in X}}{\text{Number of cycles in Y}}$$

In this test the subject must be told to continue without pausing if he makes an error. The error, as usual, is not included in the total.

4. *Aitches*

- | | | |
|--|------------|---------------|
| (1) H H H with three strokes of the pencil to each | 15 seconds | } X Activity |
| (2) $\pm \pm \pm$ (i.e. aitches sideways) | 15 seconds | |
| (3) H, etc., as in (1) | 15 seconds | |
| (4) \pm , etc., as in (2) | 15 seconds | |
| (5) H \pm H \pm H \pm , etc., alternating | 15 seconds | } Y Activity. |
| (6) The same, alternating | 15 seconds | |
| (7) The same, alternating | 15 seconds | |
| (8) The same, alternating | 15 seconds | |

$$\text{P score} = \frac{X}{Y}$$

5. ∞ and \pm

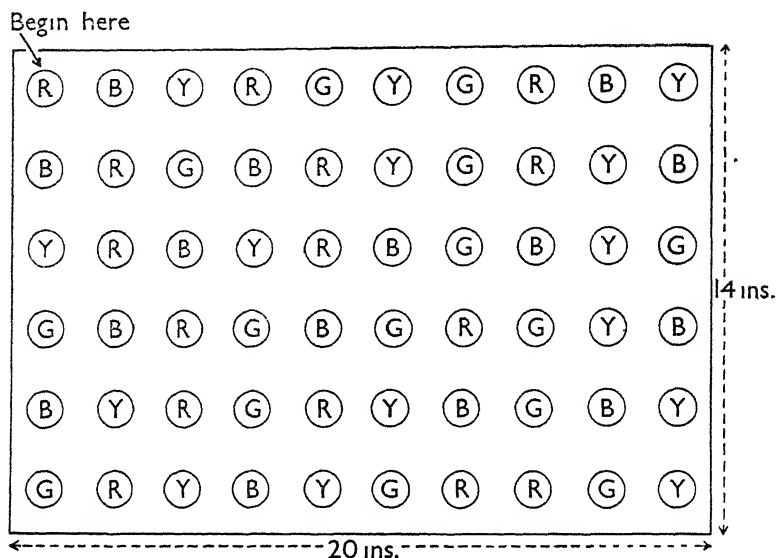
- | | | |
|---|------------|---------------|
| (1) $\infty \infty \infty$, a row of such shapes each made with one sinuous movement of the pencil | 15 seconds | } X Activity. |
| (2) $\pm \pm \pm$, each made with three strokes | 15 seconds | |
| (3) $\infty \infty \infty$, etc | 15 seconds | |
| (4) $\pm \pm \pm$, etc | 15 seconds | |

- | | | | | | |
|--|---|---|---|------------|---------------|
| (5) $\infty \pm \infty \pm \infty$, etc | . | . | . | 15 seconds | } Y Activity. |
| (6) The same | . | . | . | 15 seconds | |
| (7) The same | . | . | . | 15 seconds | |
| (8) The same | . | . | . | 15 seconds | |

$$P \text{ score} = \frac{X}{Y}$$

6. Colour Reversal

Apparatus : A large sheet, having rows of red, blue, green, and yellow spots, each the size of a halfpenny, arranged in chance order as shown.



STANDARD SHEET FOR COLOUR NAMING (REVERSAL TEST)

(R) = RED (B) = BLUE (Y) = YELLOW (G) = GREEN

FIG 58

- (1) Subject picks out and points to (with a stylus) reds and blues only, reading along the rows as in a book and calling 'red' and 'blue' aloud. He commences again at the top of the page if he reaches the bottom before time is called. 15 seconds
- (2) Subject does exactly the same, but always calls the red 'blue' and the blue 'red'. 15 seconds
- (3) As (1) 15 seconds
- (4) As (2) 15 seconds
- (5) As (1) 15 seconds
- (6) As (2) 15 seconds

X = 1, 3, and 5 Y = 2, 4, and 6

$$P \text{ score} = \frac{\text{Number of red and blue spots called out correctly in X}}{\text{Number of spots (correctly reversed) in Y}}$$

Here again the subject must be told what to do when he makes errors: in this case to correct them, without further pause, and to pass on.

General Procedure

In all these tests it is necessary to standardise as far as possible the procedure. This is achieved to some extent by:

(1) Having a standard blank on which the subject writes and which reminds him, by examples printed at the beginning of each 15 seconds row, what he has to write.

(2) Giving the subject an opportunity to rehearse the making of the shapes he has to produce. (One rehearsal only of each.)

(3) Presenting a worked model to show what the average person does, and to remind subject that the quality of the performance must not deteriorate in the Y activity in spite of difficulties.

(4) Verbally reminding the subject at the beginning of each row of the task to be carried out, e.g. "Now capital ABCD, Ready, Go!—15 seconds—Stop!" Remembering what has to be done is not part of these tests; the subject should always be perfectly clear in intention; the difficulty lies in the execution.

(5) Having all the tests on the same plan. All the above, except colour naming, are on the plan of eight periods of 15 seconds each, the first four being X and the second four Y activities.

It is important to insist to the subject that he must work at the fastest speed compatible with retaining good standards, and he should be urged, at least once in each row, to go "As quickly as possible."

The writing should be done in pencil on a standard-surfaced paper blank.

Only about 5 seconds should elapse between each of the eight rows. This gives a slight rest to the subject and time for the examiner to issue a reminder and adjust his stopwatch. No more is necessary when the subject is clear

beforehand as to what he has to do. Unless the procedure is clear to his mind, the first 'p' test is not much good, and this finding has given rise to the incorrect notion that 'p' tests must be repeated to get accurate measurements.

Four of the above tests are group tests, 1, 2, 4, and 5, whilst two, 3 and 6, can only be given individually. For many purposes of both group and individual testing, the first four mentioned make a convenient battery, requiring about 15 minutes to administer (8 minutes' actual testing).

Norms.—The quartiles and medians for these batteries with adults (over 20 years) fall at:

	<i>Lower Quartile</i>	<i>Median</i>	<i>Upper Quartile</i>
4 Test Battery	4 36	4 61	4 84
6 Test Battery	6 94	7 10	7 42

This enables one to classify subjects into four groups (which is usually sufficient for a general indication as to character), namely, low perseverators (below 4·36), moderately low perseverators (4·36–4·61), moderately high perseverators (4·61–4·84), high perseverators (4·84 and over).

'P' Tests for Children

A shorter battery of four tests on the same principles has been designed for children (6–16 years).

In these tests everything possible (short of rehearsing the whole test) should be done to make the child *perfectly clear* as to what he has to do. This may be done by clear instruction, use of model (see below), and use of prepared, standard test blanks, with lines and reminders at the beginnings of lines for the actual writing. It is a test of pure speed, not of understanding. The child should be allowed to make one of each kind of shape (X activity and Y activity) before commencing.

Particulars of Tests

1. *A, B, C.*—I want you to write abc as quickly as you can. Start when I say "Go," and stop as soon as I say "Stop." After that I want you to write capitals as quickly as you can, like that (point to a model). Then we'll do

both again (model). After that I want you to write little a, big A, like this (model) as quickly as you can.

Let the child write one set: aAbBcC. Then remind him to go *as quickly as possible*. Say "Ready—Go!" sharply, and "Stop!" at end of 15 seconds.

Model in front: (1) abc . . . 15 seconds
 (2) ABC . . . 15 seconds
 (3) abc . . . 15 seconds
 (4) ABC . . . 15 seconds
 (5) aAbBcC . . . 15 seconds
 (6) aAbBcC . . . 15 seconds

Allow about 7 seconds between "Stop" and the next "Go" (for avoidance of fatigue), and in this interval remind the subject what has to come next.

$$\text{'P' score} = \frac{1 + 2 + 3 + 4}{2(5 + 6)} .$$

2. *Triangles*.—I want you to do a row of triangles with the points upwards. (Draw triangles, making strokes very clearly and always in the same way.) Then a row with the points downwards. Repeat both. Then a row mixed, like this (model). As quickly as possible all the time. "Ready—Go!"

(1) 15 seconds
 (2) 15 seconds
 (3) 15 seconds
 (4) 15 seconds
 (5) 15 seconds
 (6) 15 seconds

$$\text{P score} = \frac{1 + 2 + 3 + 4}{2(5 + 6)}$$

3. *W's*.—Write me a row of W's like that (model) (the usual way of writing W's to which the child is accustomed). Good! Ascertain if child is left-handed and make note on his paper if he is. Now I want you to write me a row of W's backwards like this, beginning at the opposite end of

the letter. (Draw four, with reverse stroke, thus :

 instead of . Let child do four.)

As quickly as possible. (Remind child of this at frequent intervals. The whole thing *must* be done under pressure of speed.)

- (1) 15 seconds Forwards (ordinary way)
- (2) 15 seconds Forwards (ordinary way)
- (3) 15 seconds Backwards
- (4) 15 seconds Forwards (ordinary way)
- (5) 15 seconds Backwards

$$P \text{ score} = \frac{2 + 4}{3 + 5}$$

4. *Colours*.—You have to pick out the reds and the blues in these rows of colours, pointing to them with the pencil and calling out the names, like this: “red, blue, red, red, blue,” etc.

When you’ve done that twice, I want you to pick out the same colours again, but call the red ‘blue’ and blue ‘red.’ As quickly as possible each time. If you make a slip you must correct it before you go on.

Count number of colours named according to instructions, omitting errors or spots passed over.

- (1) Normal, 15 seconds
- (2) Normal, 15 seconds
- (3) Reversed naming, 15 seconds
- (4) Normal, 15 seconds
- (5) Reversed naming, 15 seconds

$$P \text{ score} = \frac{2 + 4}{3 + 5}$$

In general, when scoring, first cross out each error, i.e. errors do not penalise, they merely are not allowed to count in the total.

The total score is the sum of the four scores. Since this test battery is so short—only $5\frac{1}{2}$ minutes of actual testing time—it is advisable, if a reliable measurement is to be obtained, that it should be given twice (an intelligence test can conveniently be sandwiched between the repetitions),

especially since the inter-correlations are low on a single administration.¹

Norms.—Since this particular battery has been shown¹ to be independent of 'g,' there is no need to make any correction for intelligence, but each year of age has a slightly different score. The deciles on the graph overleaf are based on measurements on 300 boys and girls of 10–14 years of age, but until these norms are extended empirically above and below, the decile scores for younger and older children can best be obtained by continuing the decile lines upwards and downwards in the directions indicated.

The mean score for boys is about .5 higher than for girls at 14 years of age and about .25 higher at 10 years. These norms are for boys and girls together, so a rough correction may be made for, say, 14-year-old children by subtracting .25 from individual boys' scores and adding .25 to girls' scores.

When the test is given for a second time in quick succession (to provide two measurements, for greater reliability, as recommended above), .1 should be added to this second score before reading off the decile position, since there is on an average about .1 decrease in score resulting from practice (see Fig. 59, p. 220).

Stephenson's Battery

The following ten-test battery has been suggested for children by Stephenson.² Each test consists of (i) a 'normal' performance, (ii) a 'reversed' performance, (iii) an 'alternating' performance. The nature of the activities will be clear from the table below.

Each is carried out on standard forms similar to those described for the battery above, except that they have in addition an upper line to fix the size of the letters, etc., to a height of .8 cm.² (The present writer has not recom-

¹ R. B. Cattell, "On the Measurement of Perseveration," *Brit J Educ Psychol*, v, 1, 1935

² W. Stephenson, "An Introduction to So-called Motor Perseveration Tests," *Brit J Educ Psychol*, iv, 2, 1934

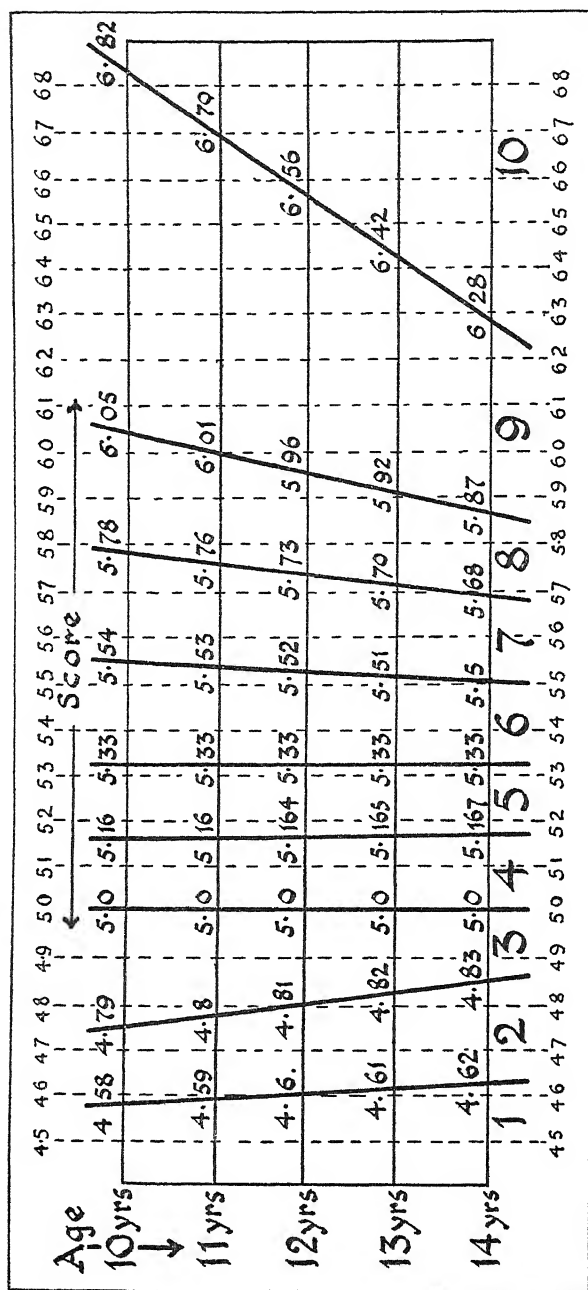


FIG 59—Decile norms for Perseveration Tests

Instructions—Find the score on the scale at the top and drop a perpendicular to the year concerned (large numbers at base) in which the score falls. Then note the decile section

mended this in the above battery, because it may have disadvantageous effects equal to its advantages.) Each line is done at speed, and except in sub-test 10, the pencil is not to be taken from the paper while each figure is being made. Sample letters are made beforehand by the child.

Each test is on the pattern:

- (a) 30 seconds of (i) ; 10-20 seconds rest pause.
- (b) 30 seconds of (i) ; 10-20 seconds rest pause.
- (c) 30 seconds of (ii) ; 10-20 seconds rest pause.
- (d) 30 seconds of (iii) ; 10-20 seconds rest pause.

$$P \text{ score} = \frac{a + b}{c + d} \text{ (numbers of letters, omitting errors).}$$

	i	ii	iii	
1	✓	✓	✓	✓
2	ω	ω	ω	ω
3	S	2	S	2
4	6	6	6	6
5	e	e	e	e
6	Z	Z	Z	Z
7	2	S	2	S
8	ā	ā	ā	ā
9	q̇	ṗ	q̇	ṗ
10	5	5	5	5

FIG. 60—Table to show each of the three activities in a battery of ten sub-tests

Some of these tests are not free from 'g,' since the ability to construct a complex mirror image or to grasp the new shape formed by image and mirror image is partly a matter of intelligence. This would invalidate a minority of the tests, and then only for young children. Stephenson sug-

gests for children of 10 and upwards a battery consisting of Nos. 2 to 10 and for children of 8-10, Nos. 1, 2, 3, 4, and 5. The inter-correlation of these tests may vary from $\cdot 65 \pm \cdot 04$ to $\cdot 20 \pm \cdot 04$.

Norms.—No norms are yet available for these tests. It would seem desirable to obtain 'equal unit' (see p. 49) norms for each test separately, so that batteries containing any required number of sub-tests can be scored easily.

A 'p' test useful with both children and adults is the well-known rotating disc (mounted in a box with standard lighting) driven by a motor governed by a sliding resistance (rheostat). The point is noticed (as speed is increased and decreased) at which flicker disappears and reappears. This test, owing to the cumbersomeness of the apparatus, is not often used, and so is not described here in more detail, but it is quite a good sub-test for a 'p' test battery. Apparatus from Raper, Psychological Laboratory, University College, Gower Street, W.C.1.

General Notes on 'p' Measurements

Other methods of scoring 'p' tests than those just described will be encountered in the literature referred to. The X-Y method has the advantage of giving a normal distribution, whereas $\frac{X}{Y}$ gives a skewed distribution in which the upper values are increasingly separated from each other. But the former method fails to eliminate speed, a serious error, and introduces correlations between sub-tests which are due to the speed factor as well as to 'p.' Stephenson and Rangachar¹ have suggested methods of eliminating speed even more thoroughly than by the $\frac{X}{Y}$ method, but they are much too time-consuming for ordinary practice.

The consistence of the 'p' tests so far devised is low, and the validity ('p' saturation) of sub-tests is rarely more than

¹ C. Rangachar, "Differences in Perseveration among Jewish and English Boys," *Brit J. Educ Psychol*, 11, 1932.

.4 (with children it is decidedly less), though the battery as a whole would have higher validity.

Nevertheless, a 'p' test such as one of the first two batteries above, requiring no more than 15-20 minutes, has been proved again and again to throw light on the nature of character integration and to reveal behaviour unsuspected from the results of any other mode of examination.

(ii) *Spot-dotting Test of Obsessional Make-up*

Culpin and Smith,¹ investigating nervous symptoms among office and factory workers, first make the discovery that unusually high scores on the McDougall-Schuster spot-dotting apparatus were made by subjects of obsessional make-up, whereas unduly poor scores were made by those with anxiety symptoms of nervousness.

These two important nervous types, as described by these research workers, need to be briefly defined as follows, since they do not correspond exactly with the conceptions of obsessional and anxiety neuroses to be found in some psycho-analytic literature.

Obsessional 'Neurotic.'—Symptoms characterised in consciousness by unreasonable drive 'Gnawing, craving, urgency' to think certain thoughts, or carry out certain actions (which may appear to the subject futile or irrational). The subject's sentiments cause him to believe strongly in the power and importance of self-control. He is generally over-conscientious, very thorough, and inclined to overwork. Such persons are frequently found among the intellectually superior, and tend to occupy superior positions of responsibility and control.

Anxiety 'Neurotic.'—Symptoms have recognisable emotional form—indeed, emotion is the main cause of discomfort. Fear of small rooms, of the dark, of being watched, etc. In positions of responsibility and authority show strain and are irritable, erratic, and unreliable with subordinates, often nagging. Prone to irrational worries.

¹ *The Nervous Temperament*, by M. Culpin and M. Smith (H M S O, 1930)

These types should be related to those described in the rating scales on pp. 230 and 232.

Probably (in the present state of our knowledge we cannot say 'certainly') the obsessional type is one with high 'w,' in spite of some nervous defect. This is implied in the above description. It is deducible also from the fact that certain forms of perseveration described in the section above, which are in fact not 'p' but typical obsessional symptoms, are associated with high 'w' rather than high perseveration. It follows again, from the observations of the present writer, agreeing with those of most clinical workers, that children of high 'w' tend to score more highly on performance tests (e.g. the Goddard Board) than their intelligence would lead one to expect—and spot dotting is, after all, a kind of performance test.

Technique.—The apparatus is a disc revolving at uniform speed, carrying a spiral trail of irregularly arranged dots. The test takes only a few minutes, during which time the actual transit speed of the dots (at which objects the subject has to aim with a pencil) increases to a degree at which failure to continue the performance occurs.

The McDougall-Schuster model, on which the norms below were made and with which other models should agree, is in Dr. Culpin's laboratory, at the London School of Hygiene, Gower Street, W.C.1. Copies may be obtained from Raper, Psychological Laboratory, University College, Gower Street, London. It is possible also to use the ordinary clockwork ribbon spot-dotting machine for this purpose, increasing the speed by means of the regulator at given intervals, but a certain amount of skill through practice is then required.

The score can be either : (1) total number of circles correctly marked; (2) number aimed at before breakdown (arbitrarily fixed at five misses in succession); (3) number correctly hit before breakdown. The correlation between these is from .93 to .96, so that any one is equally sound; (2) being the easiest to mark, is therefore accepted as the best for practical purposes.

Norms.—On this basis, among clerical workers and factory workers, the median score for obsessionals is about 190 (number aimed at before breakdown); for normal, non-nervous individuals 135; and for those with anxiety symptoms 123. About 30 per cent. of those with obsessional symptoms score above 240, and practically none below 120, whereas normals and anxiety types give 3 or 4 per cent. above 240 and at least 20 per cent. below 120.

The test, therefore, has by no means perfect validity, but as an adjunct to other character tests is definitely helpful.

There is no correlation of spot-dotting speed with age among adults, but some correlation with dexterity, absence of eye defects, and 'g'; so that these, especially the second, should be taken into consideration.

3. Measures of Specific, Restricted Character Traits

The testing of single aspects of character is sometimes necessary for special purposes, notably in vocational selection. Various tests on 'miniature situation' lines have been devised, but they have rather less validity than those described above for soundness of character as a whole. This is partly because preliminary research as to whether a single trait or 'contact' really exists, and if so, within what limits, has not been made. Useful as such tests would be, one can at present only point to the following tentative tests and suggestions.

Aggressiveness, tested by ability to gaze fixedly at an experimenter while doing difficult mental work. (This has been shown to correlate well with aggression on ratings.¹)

Conceit Index.—Suggested by Allport from a contrast of self-estimates on desirable qualities with those of independent raters.

Confidence.—A variety of tests of confidence, in judging lines, making moral judgments, etc., have been tried out

¹ Moore and Gilliland, "The Measurement of Aggressiveness," *J Appl Psychol*, v, 1921.

by Trow, who did not find, however, much inter-correlation of the different situations.¹

Endurance Test.—(Fernald.)—Ability to endure prolonged discomforts or pain (e.g. electric shocks; the holding up of a column of mercury as long as possible with the breath; standing on one leg).

Helpfulness, by reactions of subject to a second subject to whom he is instructed to give a complex test requiring much explanation.

Minnesota Scale for Measuring Inferiority Attitudes (fair consistency and validity).

Suggestibility.—This has been a much-overworked conception in psychology. As used in the general loose sense it is partly low 'w' or poor 'g,' or ignorance of the matter at issue, or emotional inclination towards that particular belief. These are not suggestibility at all in the true sense. The popular conception also includes various forms of true suggestibility, namely, primitive passive sympathy, herd suggestibility, cognitive imitation, habits of deferring to prestige authority (partly submissive disposition), emotional dependence on the father image, susceptibility to dissociation, etc. Much investigation is needed. It is not surprising, therefore, that Otis² and Brown³ found little agreement between various tests of so-called suggestibility.

Aveling,⁴ on the other hand, using prestige suggestion, obtained such good correlations between tests as to indicate the existence of a unitary functional tendency or trait. There are enough well-worked-out test situations in the accounts of the above three psychologists, particularly of Aveling, to enable one to construct a sound battery for children. Aveling found 'suggestibility' as thus measured to correlate negatively with estimates of 'common sense' but to be independent of measured intelligence.

¹ Trow, "An Experimental Study of Confidence," *Amer. J. Psychol.*

² M. A. Otis, "A Study of Suggestibility in Children," *Arch. of Psychol.*, xi, 1924

³ W. W. Brown, *Individual and Sex Differences in Suggestibility*, University of Calif., Publ. 11, 1916

⁴ F. Aveling and H. L. Hargreaves, "Suggestibility with and without Prestige in Children," *Brit. J. Psychol.*, xii, 1921

4. Probes of Complexes and Individual Patterns of Emotional Adjustment

(A) RATING SCALES AND SELF-INVENTORIES OF NEUROTIC CHARACTERS

Although the neurotic inventories mentioned on p. 206 are unsatisfactory, since they confuse in one vague conception many forms of disorder, an estimate of degree of neurosis in some definite and particular direction is often useful.

The patterns which we have to consider are the clinical syndromes described by psychiatrists. These collections of symptoms are not yet established as patterns in any statistical sense, and psychiatrists have differed, and do differ considerably among themselves, as to classificatory patterns in the neuroses.

Our divisions will be essentially those of Freud, who distinguished three true neuroses (i.e. physical disorders of the nervous system)—neurasthenia, anxiety neurosis, and hypochondria—and four psycho neuroses—conversion (classical) hysteria, fixation hysteria, anxiety hysteria (including phobia), and obsessional neurosis.

A neurosis is more than a symptom or collection of symptoms. Consequently the completion of a rating scale or inventory is of little or no value in deciding the course of treatment. Its value lies in (1) diagnostic assistance, especially with regard to degree of neurosis; (2) statistical treatment of results from whole groups, e.g. extent of neurotic difficulties among certain groups of children, students, or workpeople; frequency of neurotic traits among relatives of the insane (such surveys have in the past often given most conflicting results owing to the absence of standards of neurotic conditions); (3) determination of general type of character among 'normal' people. It is probable (*vide* McDougall, *Abnormal Psychology*) that the type of disorder to which a person is prone under stress is determined by the general character-temperament

constitution. Or, looking at the matter from the psycho-analytic point of view, the general observed character-temperament make-up is a product of the particular type of fixation, repression and conflict from which each person suffers. Whichever way the causality lies (and it may well be partly in both directions), a connection exists and, in assessing character among normal people, a measure of the tendency to one or another of the neurotic syndromes is of far-reaching importance for vocational guidance and selection, analysis of scholastic difficulties, or treatment of problem behaviour.

The following rating scales, each with a corresponding self-inventory, are intended to cover six types¹ and to be scored separately, but the total score on all may also have some value as a measure of total 'neurotic personality' tendency, as is done in Woodworth's questionnaire (p. 207); for there is some slight evidence² of the existence of a 'general neurotic factor' or neuropathic constitution apart from the special and definite types clinically separated. Finally, one must bear in mind that, though according to clinical evidence there is a tendency for people to fall into one of three types (i.e. for a syndrome to exist), transitional and mixed 'types' are found with some frequency. Moreover, as Freud, for example, has pointed out, the neurotic patterns are developmentally interrelated; for instance, an obsessional-compulsive act may arise as a solution of the anxiety (or reproach) in anxiety hysteria. Nevertheless, it seems most probable that such a solution, replacing anxiety, takes place only when a particular constitutional trend (obsessional make-up) exists or with those having a fixation at a particular level (active anal-erotic).

¹ The items included in these symptom complexes are those described by Rivers, Freud, Henderson and Gillespie, Jones, Stoddard, Hollingworth, White, and McDougall

² The evidence is mainly the impressionistic evidence of clinical psychologists, notably expressed by Rosanoff ('neuropathic inheritance'), Freud ('psycho-sexual constitution'), Babinski, and others, but, as Hollingworth points out (*Abnormal Psychology*), there is as yet no objective evidence of the existence or nature of this generalised psycho-neurotic tendency

An 'epileptic' and a 'paranoid' type have been included in the rating scales, since, although these conceptions belong to the realm of psychosis, the 'epileptic character' may be more widely distributed and its diagnosis may be of importance even when typical fits are not present; whilst the 'paranoid constitution' is far more widespread than paranoia and gives at once a picture of a definite character type. The cyclothyme and schizothyme types of the last chapter (p. 166), for that matter, constitute equally attenuated forms of the remaining important psychosis syndromes.

Three modes of assessment of each type are provided below:

(1) A Rating Scale for 'Observers,' which may be filled in by acquaintances familiar only with the observed behaviour and ordinary conversation of the subjects to be rated (as e.g. teachers assessing children, students assessing fellow students).

(2) A Rating Scale for 'Consultants,' who have special 'rapport' with the subject and training in expert psychological enquiry, and who are in a position to take into account information given confidentially by the subject.

(3) A self-inventory questionnaire, in which the subject answers particular questions (necessarily more numerous in most cases than the traits to be rated, because each trait may need to be approached in several ways), and in which the scoring is made by another person. Such self-inventories are subject to all the criticisms mentioned on p. 202, but they give reliable results under particular conditions of research (namely, with honest and intelligent subject, trained in estimates), and can also be improved slightly by a more indirect style of question than that commonly used.

Norms for these scales have not yet been formed. The writer would be much indebted to psychologists using them for any norms, validities, and consistencies found in particular researches.

(i) *Rating Scales ('Observer's' and 'Consultant's')*1. *Rating Scale on Neurasthenic Tendency (closely similar to Kraepelin's 'Chronic Nervous Exhaustion')*

Underline 0, 1, or 2 0 meaning completely absent

2 meaning present in marked degree

(1) Gets tired very easily physically ¹	0	1	2
(2) Gets tired very easily mentally ¹	0	1	2
(3) Unable to make any effort, trembles at thought of any task	0	1	2
(4) Unable to concentrate, attention easily distracted	0	1	2
(5) Memory poor	0	1	2
(6) Interest lacking or quickly disappearing	0	1	2
(7) Sense of pressure on head, pain at occiput and back of neck, irritable spine	0	1	2
(8) General malaise, aches and pains, leg heavy	0	1	2
(9) Irritability, aggressive temper	0	1	2
(10) Moodiness	0	1	2
(11) Depression, tearful or dull	0	1	2
(12) Flatulent dyspepsia and disturbances of appetite	0	1	2
(13) Constipation	0	1	2
(14) Exaggerated (deep) reflexes	0	1	2
(15) Poor sleep at night, difficulty in waking in morning	0	1	2
(16) Hypersensitiveness to bright light, to noise, and to cold	0	1	2
(17) Sweating of skin and palms of hands	0	1	2
(18) Nocturnal emissions (and ejaculatio præcox impotence)	0	1	2

Total Rating Score

For rating by observers, without interview and questioning of the subject, a ten-item scale is used (namely, items 1, 2, 3, 4, 5, 6, 9, 10, 11, and 16), but with the evidence of the subject himself (consultant's rating), the scale is used on all eighteen items. Norms for these should be distinct.

2. *Rating Scale on Anxiety Neurosis Tendency*

(1) Morbid, excessive feeling of anxiety or dread	0	1	2
(2) Occasional 'fits' (loss of consciousness, without convulsions)	0	1	2
(3) Rapid heartbeat	0	1	2
(4) Palpitation, anginal pain (pseudo-angina)	0	1	2
(5) Tremor, twitching of muscles	0	1	2
(6) Sweating of hands and feet, nocturnal perspiration	0	1	2
(7) Lack of appetite, dryness of mouth, flatulence, fullness in stomach, nausea	0	1	2
(8) Breathlessness, sense of suffocation or breathing oppression, asthma	0	1	2
(9) Constipation and diarrhoea co-existing	0	1	2
(10) Sleeplessness	0	1	2
(11) Hypersensitiveness to light, sound, etc., 'jumpy' nerves	0	1	2
(12) Depression, irritability, and excitability	0	1	2
(13) Restlessness and inability to concentrate	0	1	2
(14) Vasomotor constriction, coldness and blueness of extremities	0	1	2
(15) Weakness of limbs and blurring of vision	0	1	2
(16) Frequency of micturition (and of seminal emissions)	0	1	2

Total Rating Score

¹ This is observable at once by the way in which the work curve on the ergograph or adding sheets declines from the beginning. Also in eye fatigue in reading and in restriction of visual field (perimeter)

Not all psychologists are agreed that the last five items are rightly included. An 'Observer's' rating can be made on 1, 2, 5, 7, 11, 12, 13, and 14; a 'Consultant's' on all sixteen items.

3. *Rating Scale on Anxiety Hysteria Tendency (Phobias)*

Some psychologists include this and the anxiety neurosis in one syndrome under the term 'psycho-neurotic anxiety state.' It seems better, however, to regard the anxiety neurosis as a syndrome which may exist alone or, with additional features, as an anxiety hysteria, since, after dissolution of the latter by psycho-therapy, a core of physical symptoms—the anxiety neurosis—may persist.

A rating on this tendency should therefore include the sixteen items of (2) above, *plus* the following:

(17) Anxiety, fear or anguish in closed spaces, railway carriages	0	1	2
(18) Anxiety, fear or anguish in large gatherings or open spaces	0	1	2
(19) Fear of insanity or of recurrence of hysterical fit	0	1	2
(20) Fear of bodily illness or disease	0	1	2
(21) Exaggerated fear of heights	0	1	2
(22) Any particular 'irrational' fear (fire, cats, opening letters, insects, thunder)	0	1	2
(23) Night terrors (nightmare)	0	1	2

Total Rating Score

Though the deduction of these from behaviour may make possible an 'Observer's' rating, the phobias are often so well concealed, even from close friends, that only a 'Consultant's' rating can be made.

4. *Rating Scale on Conversion (Classical) Hysteria Tendency*

(1) Presence of non-organic paralysis (of co-ordinated muscles)	0	1	2
(2) Presence of non-organic anæsthesia (glove and stocking type)	0	1	2
(3) Fits, occurring only in presence of others, with trivial self-injury	0	1	2
(4) Presence of tics, contractures, or convulsions	0	1	2
(5) Other physical conversion symptoms, pains, headaches, migraine, dermatographies, ¹ globus hystericus ²	0	1	2
(6) Peculiarities over food, occasionally excessive eating, more commonly inadequate eating and loss of appetite	0	1	2
(7) Splitting of personality, variation of two or more personalities	0	1	2
(8) Somnambulism or excessive sleep talking	0	1	2
(9) Episodic dream states, fugues	0	1	2
(10) Stuttering, inability to speak, loss of voice	0	1	2
(11) Complete forgetting of certain (important) incidents and remarks (sometimes over a few days only)	0	1	2
(12) Susceptibility to hypnosis and suggestion	0	1	2

¹ Markings, blisters, etc., appearing on the skin without apparent cause

² A feeling of fullness in the throat and sense of suffocation

(13) Combination of emotionality (especially erotic) and excitability, with primness and reserve	0	1	2
(14) Shallow feelings, but excessive expression	0	1	2
(15) Lack of persistence of feelings and of efforts	0	1	2
(16) Vanity, desire to impress and gain attention	0	1	2
(17) Craving and seeking sympathy (with avoidance of responsibilities)	0	1	2
(18) Emotional instability	0	1	2
(18) Rapid variation and unpredictability (crying and giggling, kiss and slap)	0	1	2
(19) Elation or offence at trivialities, outbursts of excitement, anger, and sullenness	0	1	2
(20) Simulated foolishness and childishness, inept funniness	0	1	2
(21) Vivid compensatory day-dreaming, leading to fabrication of half-believed stories	0	1	2
(22) Essentially calm mental attitude, Janet's 'belle indifférence' to grave personal problems, except for short periods of stress	0	1	2
(23) Sleeplessness	0	1	2
(24) Vasomotor disturbances, flushing, trembling, blanching	0	1	2

Total Rating Score

Suggested 'Observer's' scale Nos. 1, 2, 4, 6, 7, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24

'Consultant's' scale All numbers

5. Rating Scale on Obsessional-Compulsive Tendency (Janet's 'Psychasthenia')

(1) Constant preoccupation with a single topic (usually trivial and felt by the subject to be so)	0	1	2
(2) Obsessive rumination (<i>folie de doute</i>), e.g. speculations about small religious points or 'Why must I breathe?', 'What was the first cause?',	0	1	2
(3) Scrupulous compulsions to carry out trivial tasks, e.g. to read notices, to fold up clothes in a particular fashion	0	1	2
(4) Compulsions to totally unnecessary acts, e.g. to count windows, to utter rhymes or phrases, to touch or step over objects, to wash too frequently	0	1	2
(5) Fear of compulsion to carry out dangerous, immoral, or destructive acts, e.g. to stab someone, to set fire to something, to mutilate animals, to swear in church, etc.	0	1	2
(6) Obsessive fear of some unlikely danger or of no danger, e.g. of destroying something valuable, of blushing, of dust, of fire	0	1	2
(7) Obstinacy Assertive character with insistence on the power of the will, aggressiveness	0	1	2
(8) Orderliness Over-conscientiousness and exaggerated detailed thoroughness in general work	0	1	2
(9) Insomnia (not invariable)	0	1	2
(10) Parsimony	0	1	2

Total Rating Score

Assessment on practically all of this scale requires the co-operation of the subject, since compulsions are generally effectively disguised or hidden from acquaintances

6. Rating for Epileptoid Character

It is generally agreed to-day that the epileptic character is not secondary to the disease; that it may be present in

some degree in those not subject to discernible fits, and that the diagnosis of epileptic personality is important in deciding whether or not fits are of an epileptic nature.

(1) Presence of fits (grand mal, petit mal, or trance state)	0	1	2
(2) Egocentricity (undue importance attached to own activities, however trivial and childish they may be)	0	1	2
(3) Vain, ¹ susceptible to flattery, will work for praise but not for love	0	1	2
(4) Matters of personal interest remembered (especially bodily illness), all matters of general interest forgotten	0	1	2
(5) Inattention and loss of interest in what is happening around him	0	1	2
(6) Memory poor both for recent and remote events	0	1	2
(7) Poverty and restriction of ideas, words brought out and used with increasing difficulty (low 'f')	0	1	2
(8) Sluggishness, speech, and thinking slow, slow to grasp new ideas (hence misunderstandings)	0	1	2
(9) Perseveration, pedantically elaborates ideas with stilted and hackneyed phrases and composition	0	1	2
(10) Constantly busily engaged, yet essentially lazy and avoids effort	0	1	2
(11) Irritable, sensitive, quickly in a rage, not subservient to discipline	0	1	2
(12) Brutal and ferocious—disproportionate violence	0	1	2
(13) Prone to sexual perversions, especially auto-eroticism (infantile, polymorphous perverse)	0	1	2
(14) Deliberate, 'plateaux', ² speech	0	1	2
(15) Taciturnity alternating with over-friendliness	0	1	2
(16) Selfish kind of religious devotedness (father dependence?) and shallow professions of interest in others	0	1	2
Total Rating Score			

In this case the 'Observer's' rating scale corresponds with the 'Consultant's'—sixteen items in each

Rating Scale on Paranoid Constitution—Syndrome 7

Paranoia—the tendency to systematised delusions without disturbance of emotional constitution—has a considerable hereditary element. A greater or lesser tendency to paranoid reactions is often evident, therefore, when no development of the disease has taken place. In contrast with all other psychotics, paranoiacs rank high on 'w' estimates, and do not have a 'p' score differing in any way from that of normal people (see p. 208).

(1) Systematised delusions of a megalomaniac, persecutory, amorous, jealous, litigious, religious, or hypochondriacal type	0	1	2
(2) Addition to fads, garrulity on special topics, writing to the newspapers, etc	0	1	2
(3) Sensitive, brooding, uneasy mind	0	1	2
(4) Inability to correct and modify ideas once adopted or to make practical concessions	0	1	2

¹ But not necessarily caring about the personal appearance

² Speech with a monotonous tone, lacking flexibility, discernible by plateau form of voice-curve tracing.

(5)	Self-willed obstinacy	0	1	2
(6)	Egotism (but not selfishness in other senses), seeing first and last the reference of any happening to the self	0	1	2
(7)	Suspiciousness and distrust, leading to misinterpretation of events and intentions and to re-interpretation of events in memory	0	1	2
(8)	Retiring, solitary	0	1	2
(9)	Shame and uncertainty in relation to others, morbid, introspective-ness as to standing in others' opinions	0	1	2
(10)	Irritability	0	1	2
(11)	Passionate excitability, sometimes leading to rough and violent behaviour	0	1	2
(12)	Ill-balanced aims, unduly lofty or expansive projects	0	1	2
(13)	Exaggerated pride and self-esteem	0	1	2
(14)	Easily fatigued by work or emotion, inability to perform steady work	0	1	2
(15)	Insomnia and sense of worry	0	1	2
(16)	Unsteadiness of gaze	0	1	2

Total Rating Score .

All of these (with the possible exception of (15)) are equally suitable for observers' or consultants' rating, but most incipient paranoid reactions are so well disguised that a 'Consultant' type of estimate is alone reliable

(ii) *Personal Questionnaires, Corresponding to above Rating Scales*

The following questionnaires imply a certain amount of self-rating, but are as far as possible indirect—to the extent of demanding information about behaviour, mental habits, and judgments on others instead of direct assessments of the self on personality features.

Each questionnaire agrees very closely in its items with the corresponding Rating Scale above. (There is, however, no questionnaire provided to correspond with Epileptoid personality.)

No title (other than Syndrome 1, etc.) is given at the head of the questionnaire, because it is meant to be given to subjects exactly as it stands. Subjects should be given a preliminary talk on the confidential nature of the results and of the necessity for being essentially frank. The system of underlining one of three alternatives after each item should be explained to them. No time limit is applied. No general norms are yet available. They should be formed directly for the group with which the experimenter is working. The author will be very glad to receive such results to incorporate in general norms.

All the questionnaires used together (except the epilep-

toid character) constitute a rating on general neurotic traits covering practically the same ground as the Woodworth Personal Data Sheet. For this purpose the experimenter must arrange the six syndromes to run consecutively, forming 120¹ questions in all.

Personal Questionnaire—Group I Syndrome

- | | |
|---|---|
| 1. Do you find yourself getting physically tired very easily and wanting to lie down? | 0. No.
1. Occasionally.
2. Often. |
| 2. Do you get tired mentally very easily and feel tired most of the time? | 0. No.
1. Occasionally.
2. Often. |
| 3. Do you get very worried, tremble, and perspire at the thought of a difficult task before you? | 0. No.
1. Occasionally.
2. Often. |
| 4. Are there times when you are unable to concentrate, when your mind wanders, and the slightest thing distracts you? | 0. No.
1. Occasionally.
2. Often. |
| 5. Do you have much trouble in making up your mind, e.g. as to what you will do next? | 0. No.
1. Occasionally.
2. Often. |
| 6. Do you find your memory very poor and letting you down on important matters? | 0. No.
1. Occasionally.
2. Often. |
| 7. Do you feel a lack of interest in things that used to interest you and find yourself quickly getting tired of friends, amusements, etc.? | 0. No.
1. Occasionally.
2. Often. |
| 8. Do you sometimes get a dragging sense of pressure on top of your head or the back of your neck? | 0. No.
1. Occasionally.
2. Often. |
| 9. Have you frequently a kind of back-ache, heaviness of the limbs, and a sense of general unfitness? | 0. Not at all.
1. In a slight degree.
2. Very much. |

¹ The insomnia item occurs more than once, it should therefore be omitted on its second occurrence

- | | |
|--|---|
| 10. Do you find yourself getting irritable and aggressive without cause, snapping at people for trifles? | 0. No.
1. Occasionally.
2. Very much. |
| 11. Are you troubled by moods of 'fed upness,' grouchiness, lowness of spirits, and feelings of despair? | 0. No.
1. Occasionally.
2. Very much. |
| 12. Do these moods keep coming and going without any particular reason for them? | 0. No.
1. Occasionally.
2. Often. |
| 13. Do you suffer from indigestion, so that your appetite is 'finnick' and uncertain? | 0. No.
1. Occasionally.
2. Often. |
| 14. Are you constantly troubled by constipation? | 0. No.
1. Occasionally.
2. Often. |
| 15. Do you find yourself unable to sleep well? | 0. No.
1. Occasionally.
2. Often. |
| 16. Do you have difficulty in waking in the morning and feel not well rested after sleep? | 0. No.
1. Occasionally.
2. Often. |
| 17. Are you 'jumpy,' e.g. do you find it hard to work where there are bright lights or sudden noises? | 0. No.
1. Occasionally.
2. Often. |
| 18. Are you very sensitive to pressure of boots, clothes, etc., or unable to tolerate rough material next to your skin? | 0. No.
1. Occasionally.
2. Often. |
| 19. Are you troubled by sweating of the skin, generally and especially of the palms of the hands? | 0. No.
1. A little.
2. Very much. |
| 20. As a child, did you have the habit of bed-wetting or, as an adult, are you troubled by excessive nocturnal sexual emissions? | 0. No.
1. Occasionally.
2. Often. |

Personal Questionnaire—Groups II (1 to 18 inclusive) and III (1 to 28 inclusive)

- | | |
|--|---|
| 1. Do you ever have a queer excessive feeling of anxiety or dread without any reason? | 0. No.
1. Occasionally.
2. Often. |
| 2. Have you ever had a 'fit' of dread (without obvious cause) which has caused you to faint or collapse? | 0. No.
1. Occasionally.
2. Often. |
| 3. Does your heart beat too quickly at times or thump in your ears so that you cannot sleep? | 0. No.
1. Occasionally.
2. Often. |
| 4. Are you bothered by fluttering or palpitating heart (seeming to miss a beat) or by cramp pains in the heart region? | 0. No.
1. Occasionally.
2. Often. |
| 5. Have you tremors of the hand (feeling shaky) or incessant twitching of certain muscles? | 0. No.
1. Occasionally.
2. Often. |
| 6. Are you bothered by excessive sweating of hands and feet, and have you awakened in the night covered with perspiration? | 0. No.
1. Occasionally.
2. Often. |
| 7. Do you suffer from indigestion and impaired appetite? | 0. No.
1. A little.
2. Very much. |
| 8. Do you ever have feelings of fullness in the stomach, of dizziness and sickness without apparent cause? | 0. No.
1. Occasionally.
2. Often. |
| 9. Have you ever had feelings of suffocation; of inability to get sufficient air and oppression of breathing? | 0. No.
1. Occasionally.
2. Often. |
| 10. Have you suffered from prolonged intestinal disturbance with alternating constipation and diarrhoea? | 0. No.
1. Slightly.
2. Very much. |

- | | |
|---|--|
| 11. Do you sleep badly, waking after a few hours' sleep, etc.? | 0. No.
1. Occasionally.
2. Often. |
| 12. Do you 'jump' badly at sudden lights, sounds, or touches? | 0. No.
1. Occasionally.
2. Often. |
| 13. Do you find yourself having moods of undue excitability, depression, or irritability? | 0. No.
1. Occasionally.
2. Often. |
| 14. Are there times when you feel very restless, unable to settle down or to concentrate on anything? | 0. No.
1. Occasionally.
2. Often. |
| 15. Are you bothered by cold feet and hands, going blue even in moderate cold? | 0. No.
1. Very slightly.
2. Very much. |
| 16. Does the power ever go out of your limbs so that you have to lean against something? | 0. No.
1. Occasionally.
2. Often. |
| 17. Do things ever swim before your eyes, or go blurred or misty? | 0. No.
1. Occasionally.
2. Often. |
| 18. Are you troubled by having to pass urine with undue frequency? | 0. No.
1. Occasionally.
2. Often. |
| 19. Are you troubled by fear of being crushed in a crowd? | 0. No.
1. Occasionally.
2. Often. |
| 20. Are you apprehensive when shut in small closed spaces, e.g. railway carriages, tunnels, cellars? | 0. No.
1. Occasionally.
2. Often. |
| 21. Does it make you uneasy to cross a bridge, or a wide street or open square? | 0. No.
1. Slightly.
2. Very. |
| 22. Have you ever been afraid of going insane? | 0. No.
1. Occasionally.
2. Often. |

- | | |
|---|---|
| 23. Have you ever feared that you are a victim to heart trouble or to some constitutional disease? | 0. No.
1. Occasionally.
2. Often. |
| 24. Are you afraid that you may jump off or step over when you are on a high place? | 0. No.
1. Occasionally
2. Often. |
| 25. Do you have fears and worries about things without sufficient cause? | 0. No.
1. Occasionally.
2. Often. |
| 26. Have you a particular dislike of any one of these, so that you cannot contemplate it without a shudder? Thunder, spiders, moths, the dark, cats, blood. | 0. No.
1. A little.
2. Very much. |
| 27. Have you any particular dread not mentioned above, and are you much worried by it? | 0. No.
1. Occasionally.
2. Often. |
| 28. Do you have nightmares or wake up frightened in the middle of the night? | 0. No.
1. Occasionally.
2. Often. |

Personal Questionnaire—Group IV Syndrome

- | | |
|--|---|
| 1. Have you ever had an arm or leg or face muscle paralysed? | 0. No.
1. Once.
2. Several times. |
| 2. Have you ever gone temporarily blind, half-blind or deaf, or lost sensation? | 0. No.
1. Occasionally.
2. Often. |
| 3. Have you ever had fits or convulsions? | 0. No.
1. Occasionally.
2. Often. |
| 4. Have you ever had the habit of twitching your face, neck, or shoulders involuntarily? | 0. No.
1. Slightly.
2. Very occasionally. |

5. Are you troubled by severe headaches of a neuralgic kind?
 0. No.
 1. Occasionally.
 2. Often.
6. Have you at times had a dislike for all food, or a feeling that you would be sick at the thought of it?
 0. No.
 1. Occasionally.
 2. Often.
7. Do you at some times feel a totally different person from what you are at other times, and find yourself contradicting your other point of view?
 0. No.
 1. Occasionally.
 2. Often.
8. Do you walk in your sleep?
 0. No.
 1. Occasionally.
 2. Often.
9. Do people tell you that you talk in your sleep?
 0. No.
 1. Occasionally.
 2. Often.
10. Do you ever do things in a dream-like state without remembering afterwards what you have done?
 0. No.
 1. Occasionally.
 2. Often.
11. Have you ever been a stutterer?
 0. No.
 1. Slightly.
 2. Very much.
12. Have you ever been temporarily dumb, or lost your voice (except from a cold)?
 0. No.
 1. Occasionally.
 2. Often.
13. Do you ever find that you have forgotten periods of your life completely (since infancy)?
 0. No.
 1. Possibly.
 2. Yes.
14. Have you ever been in an hypnotic state?
 0. No.
 1. Occasionally.
 2. Often.
15. Do you think that most people hide a good deal of their emotion?
 0. To a slight extent.
 1. To some extent.
 2. To a high degree.

- | | |
|--|--|
| 16. Do you like acting and theatrical activities? | 0. No.
1. A little.
2. Very much. |
| 17. Would you choose to have constant change and variety of excitement if you could? | 0. No.
1. In moderation.
2. A good deal. |
| 18. Do you admire a person who can make a great impression in company and evoke general attention? | 0. No.
1. Occasionally.
2. Often. |
| 19. Have you ever been the victim of cold and unsympathetic treatment, e.g. by parents, teachers, friends, or employers? | 0. No.
1. Occasionally.
2. Often. |
| 20. Do you sometimes have emotions that you hardly know how to express, so that people don't understand you? | 0. No.
1. Occasionally.
2. Often. |
| 21. Do you sometimes have cause to regret having been unduly angry, sulky, or excited in disagreements over trivial matters with friends? | 0. No.
1. Occasionally.
2. Often. |
| 22. Do you find it a relief at times to throw off your responsibilities and indulge in childish amusements, have a lark, and be generally foolish? | 0. No.
1. Occasionally.
2. Often. |
| 23. Have you ever had vivid day-dreams (since infancy) in which you could almost believe the happenings to be true? | 0. No.
1. Occasionally.
2. Often. |
| 24. Are you capable of shutting out of your mind completely for a time things that might worry or disturb you so that you can be happy even in difficulties? | 0. No.
1. Occasionally.
2. Generally. |

- | | |
|--|---|
| 25. Do you suffer from disinclination to sleep and periods of wakefulness at nights? | 0. No.
1. Occasionally.
2. Often. |
| 26. Are you inconvenienced by uncontrollable blushing, trembling, or blanching? | 0. No.
1. Slightly.
2. Very much. |

Personal Questionnaire—Group V Syndrome

- | | |
|--|---|
| 1. Are you aware of being bothered by trivial, useless thoughts or ideas that keep coming into your mind, e.g. a tune or a saying? | 0. No.
1. Slightly.
2. Very much. |
| 2. Do you sometimes think over some small problems again and again until you find you can't leave them alone? | 0. No.
1. Occasionally.
2. Often. |
| 3. Are you ever impelled to carry out trivial tasks with undue scrupulousness; e.g. folding up clothes, reading notices, cleaning things? | 0. No.
1. Occasionally.
2. Often. |
| 4. Do you sometimes get satisfaction from doing quite useless acts, e.g. counting windows, uttering rhymes or phrases, tapping lamp-posts? | 0. No.
1. Occasionally.
2. Often. |
| 5. Have you ever been afraid that you might strike or stab somebody, or set fire to something, or steal, in spite of your will? | 0. No.
1. Occasionally.
2. Often. |
| 6. Were you ever haunted by a fear of some unlikely or trivial happening, e.g. destroying valuable papers, being spied upon, blushing? | 0. No.
1. Occasionally.
2. Often. |
| 7. Do you regard strong will power as one of the most important virtues? | 0. No.
1. Occasionally.
2. Often. |

- | | |
|--|---|
| 8. Do you think it right to insist on orderliness and thoroughness in everything that a person does? | 0. No.
1. Moderately.
2. Yes. Decidedly. |
| 9. Are you troubled by sleeplessness through ideas running on and on in your head? | 0. No.
1. Occasionally.
2. Often. |
| 10. Have you ever had a strong desire to commit suicide? | 0. No.
1. Occasionally.
2. Often. |
| 11. Were you brought up to feel that thrift is one of the most important virtues? | 0. No.
1. To some extent.
2. Very definitely. |
| 12. Did you ever have the habit of biting your finger-nails or gnawing the end of your pencil? | 0. No.
1. Occasionally.
2. Often. |

Personal Questionnaire—Group VI Syndrome

A self-rating on the epileptic character is not possible by a direct questionnaire, since the features are not introspectible happenings, but traits of personality, which could be reliably assessed only by projection tests or some other indirect technique.

The following questionnaire on paranoid reactions depends for the assessment of milder symptoms on frank self-introspection. But owing to the impregnable self-opinionatedness of the paranoiac, no indication of graver symptoms could be obtained in this way. Consequently, the questionnaire attempts to approach these indirectly, with what success remains to be seen.

In evaluating results it must not be overlooked that such a constitution is not, in a sense, abnormal; that many valuable reforms and inventions have been carried through by paranoid types, etc., and that only certain forms of paranoia find their way into mental hospitals.

Personal Questionnaire—Group VII Syndrome

- | | |
|--|---|
| 1. Do you hold a number of views on important matters which differ radically from those of the average man and concerning which you think the general viewpoint is entirely wrong? | o. None of importance.
1. A few points.
2. Many points. |
| 2. Do you know of any people who are trying to do you harm? | o. No.
1. One or two.
2. Many. |
| 3. Looking back at your school days, do you think that parents or teachers found fault with you perhaps more than you deserved? | o. No.
1. Occasionally.
2. Often. |
| 4. Do you feel upset when friends fail to see you and 'Cut you dead' in the street (presumably by accident)? | o. No.
1. Slightly.
2. Very much. |
| 5. If you have a difference of opinion with people, does it disturb you inwardly, rankle, or make you feel uneasy for a long time? | o. No.
1. In a slight degree.
2. Very much. |
| 6. Have you ever been troubled when walking in the street by the feeling that many people are watching you? | o. Never.
1. Occasionally.
2. Often. |
| 7. Have you ever had an unaccountable feeling that people can read your thoughts and make you do things against your will (by a kind of hypnotism)? | o. Never.
1. Occasionally.
2. Often. |
| 8. If you have entered on a course of action with a certain plan in mind, do you prefer to carry on with it in spite of discomforts instead of modifying it all the time in response to suggestions? | o. No.
1. Occasionally.
2. Often. |

- | | |
|---|--|
| 9. Can you be 'self-willed' and 'obstinate' when a principle is concerned? | o. Never.
1. Sometimes.
2. In a high degree. |
| 10. When you have heard a story but are later told some new facts which modify it, do you ever find yourself absent-mindedly sticking to the original? | o. Never.
1. Rarely.
2. Fairly often. |
| 11. Do you feel that people take an unnecessarily long time to recognise the value of your work? | o. No.
1. In some things.
2. Often. |
| 12. Have you ever been accused of being too cold, proud, and 'stuck up'? | o. Never.
1. Occasionally.
2. Often. |
| 13. Have you ever had cause to suspect that someone has been trying to poison you or make you ill? | o. Never.
1. Occasionally.
2. Often. |
| 14. Do you think that most people spend too much time in social life and have insufficient time to think in solitude? | o. No.
1. To some extent.
2. Decidedly. |
| 15. Are you shy and uncertain of yourself in your relations with others (particularly inferiors and superiors), and are you troubled a lot by thoughts about what others are thinking of you? | o. No.
1. In a slight degree.
2. Very much. |
| 16. Do you sometimes unjustly accuse yourself of disagreeableness and find later that the fault was in fact with the other people? | o. No.
1. Occasionally.
2. Often. |
| 17. Are you the sort of person who is normally calm, but who can be moved passionately to action by injustice or for the sake of a principle? | o. No.
1. In a mild degree.
2. Very much so. |

- | | |
|--|--|
| 18. Have you ever taken violent action against a persistently evil person for the above reasons (17)? | 0. Never.
1. Occasionally.
2. Often. |
| 19. Do you find yourself getting tired easily by work or emotional stress, so that you can't apply yourself as you would wish? | 0. No.
1. Occasionally.
2. Often. |
| 20. Do you find ideas about some particular thing going on and on in your mind so that you are unable to sleep? | 0. No.
1. Occasionally.
2. Often. |

No norms for these questionnaires among normal and abnormal persons have yet been built up. They should be built up on a percentile basis for the groups with which each experimenter is concerned. The author will be pleased to receive contributions towards such norms from authenticated research sources.

(B) WORD ASSOCIATION AND FREE ASSOCIATION METHODS

(i) *Word Association*

Few techniques have proved their value so definitely as Jung's cleverly-worked-out Word Association method, first propounded thirty years ago.¹ The method consists in instructing the subject to respond to the word which is called out to him with the first word that comes into his mind, as quickly as possible and without regard to the apparent relevance or propriety of the response word. A carefully prepared series of stimulus words is read out, the response word is noted, and the time elapsing between the utterance of the stimulus word and the response is recorded by a reaction time apparatus (lip key is best) or stop-watch reading to fifths of a second.

Immediately afterwards the stimulus words are read out to the subject again, and he is asked to reproduce the words he gave as responses on the first occasion (he is not forewarned that this will happen). His ability to do so, or, failing that, the substitute words he presents, are recorded.

¹ *Diagnostische Assoziationstudien*, Leipzig, vol i, 1906, vol ii, 1910

Jung's list of 100 words for adult analyses is given below. Both the original¹ and the modified series are given, the original being in brackets where the words differ from the later version.

	1 head		35 mountain		68 paint
	2 green (to die)		36 play		69 part
	3 water		37 salt		70 old
(to sing)	4 stick		38. new		71. flower
(dead)	5 angel		39 custom (to beat)		72 strike
	6 long (to pray)		40 ride (box)		73 chest
(ship)	7 boat (money)		41 wall (wild)		74 savage
(to pay)	8 plow (foolish)		42 stupid		75 family
(window)	9 wool (pamphlet)		43 handle		76. wash
	10. friendly		44 despise		77 cow
(to cook)	11. table (finger)		45 tooth (friend)		78 strange
	12. ask (expensive)		46 right		79 luck
(cold)	13 state (bird)		47 folk (lie)		80. tell
(stem)	14 defiant (to fall)		48 stink (deportment)		81 decorum
(to dance)	15 stalk		49 book		82 narrow
(village)	16 dance		50 unjust		83 brother
(lake)	17 sea		51 frog (to fear)		84. injury
	18 sick (to part)		52 divide		85 stork
(bride)	19 pride		53 hunger		86 false
	20 cook		54 white (anxiety)		87 decorum
	21. ink (child)		55 ox		88 kiss
(angry)	22. bad (to take care)		56 attend (bride)		89 fire
	23 needle (lead pencil)		57 pencil (pure)		90. dirty
	24 swim		58 sad		91 door
(voyage)	25 journey		59 plum		92 choose
	26 blue (to marry)		60 meet		93 hay
(lamp)	27 bread (house)		61 law (contented)		94 steep
(to sin)	28 threaten (dear)		62 love (ridicule)		95 derision
(bread)	29 lamp		63. glass		96 sleep
	30 rich (to quarrel)		64 fight		97 month
	31 tree (far)		65. traits (mice)		98 coloured
(to prick)	32 sing (great)		66 great (woman)		99 dog
	33 pity (carrot)		67 potato (to abuse)		100 speak
	34. yellow				

The list which the author finds most useful with children and adolescents is given on pp. 249-50. Most of these words are likely to be of significance with 'problem' cases. They are arranged in alphabetical order so that the subject may not be led to ponder unduly on the selection and arrangement of words, and so that the experimenter may be assisted to refer quickly to the result on any word that particularly interests him. Banal words lacking in possible significance have been inserted as a buffer between words likely to have emotional value, in order that

¹ Jung, "The Association Method," *Amer J Psychol*, 1910

perseveration effects from any given word (see p. 251) may be more clearly revealed.

Explain to the subject that he must respond *as quickly as possible*. With children it is necessary to insist on this afresh from time to time. Give four practice words (dog, pen, etc.) before the 100 significant words begin. Proceed at an even rate, calling words very clearly and timing from the last syllable of the uttered word to the first sound of response. Make no comment on responses—this would upset reproduction by modifying the carry-over effect from one word to another. Facilitate recording by having the words printed in the manner shown; the time can be indicated by a tick in the appropriate column, if less than 4 seconds (fractions of a second are not important) and by a number if 4 seconds or more. Similarly, physical signs of embarrassment can be recorded by a tick. When working through the reproductions, try to proceed with a smooth, even rhythm, ticking where correct, writing down quickly where different. Afterwards write in the space below the list the words and responses which have been selected as significant according to the criteria listed below.

Complex Indicators and Criteria of Significant Associations

The following list includes those suggested by Jung, those confirmed by later workers, and some items observed in the work of the present writer.

A. *Concerning the Manner of the Responses*

(1) Unduly long reaction time (also, rarely, abnormally rapid).

(2) Unduly long reaction time to the stimulus immediately following. Very rarely this may arise from intellectual difficulties, e.g. absence of a synonym or an opposite when the subject is set to give each.

(3) Hesitation and correction of barely uttered word.

(4) Physical signs of embarrassment, twitching, blushing, expressive gesture, drumming with the fingers, etc., with apparatus, also, breathing curve (effort sign); increase of pulse rate; psychogalvanic reflexes (see p. 258).

FIG 61—STANDARD ASSOCIATION-WORD CARD

List of one hundred association words arranged especially for use with children

Stimulus Word	Time (in seconds)						Response	Reproduction
	$\frac{1}{2}$	1	2	3	More than 3	Standard Time		
<i>Practice Words</i>								
DOG								
PEN								
CLEVER								
JUMP								
afraid*				✓		6½	Against	✓
ask		✓				3	question	✓
ashamed*					7	6	dishonest	deceitful
baby				✓		3½	small	✓
bed				✓		2	rest	✓
be careful		✓				4½	warning	✓
boys					8	2	human beings	friends
blushing		✓				2½	colour	✓
brother	✓					2	in family	✓
bully	✓					2½	enemy	afraid
burglar				✓		3	thief	✓
can't do it	✓					4	afraid	✓
clumsy	✓					3½	careless	✓
cocoa			✓			1½	liquid	✓
cruel					4	2½	coward	hard
cradle				✓		2½	rest	✓
coward*				✓		4½	afraid	against
chase	✓					2	run	✓
Daddy				✓		1	parent	✓
dark		✓				2	colour	✓
dash		✓				2	make haste	✓
death		✓				3	asleep	✓
desk			✓			1½	sitting	✓
deceitful*	✓					4	sly	✓
dirty					4	2	unclean	✓
disobey*					5	5½	untrustful	unfaithful
do-your-best	✓					4½	faithful	✓
dreaming		✓				2½	sleeping	✓
eating sweets		✓				2½	chewing	✓
enemy	✓					4	against	✓
fainting		✓				4	sleeping	✓
fool . .				✓		3½	silly	✓
forget*				✓		3	thoughtless	✓
far away				✓		2	miles	✓
friends				✓		3½	company	✓
goodhiding			✓			4	disobey	✓
girls					4	2	family	✓
guilty					6	4	treason	unfaithful
grown-up-people			✓			1½	adults	✓
happy*		✓				2½	joyful	✓
helpless		✓				6	weak	✓
hate			✓			3	enemy	✓
hospital		✓				2	place	✓
hurry up		✓				1½	quick	✓
intelligent*		✓				4	sense	✓
jealous*		✓				4½	against	✓
kind		✓				2	enemy	✓
kiss .		✓				4	love	✓
lamb		✓				1½	sheep	✓
laugh			✓			2½	happy	✓
laziness		✓				2	ungrateful	weak
lavatory					7	6	article	✓
little		✓				1	small	✓
lie		✓				2	deceitful	✓

Stimulus Word	Time						Response	Reproduction
	$\frac{1}{2}$	1	2	3	More than 3	Standard Time		
love*		✓				3	kind	✓
manners		✓				3½	polite	✓
marry	✓					2½	love	✓
mother					4	1½	parent	home
money				✓		2	spend	✓
mischievous						3	sly	✓
mother's boy (or girl) 1		✓				2	daughter	✓
music		✓				2	joyful	✓
naked	✓					1½	stripped	✓
narrow	✓					2	thin	✓
nasty man*	✓					4	hateful	✓
nest		✓				2	home	✓
nightmare						3	dream	✓
orphan boy (or girl) 1						2½	homeless	✓
playing	✓					2½	toy	✓
punishment*		✓				3½	disobey	✓
quarrelling*		✓				2	unfriendly	✓
row*		✓				2½	quarrel	✓
romping		✓				2	noise	✓
run away*					4	3½	afraid	stay
school work			✓			2	lesson	✓
selfish		✓				4	unkind	✓
showing-off*		✓				4½	swank	✓
sister	✓					2	friend	✓
shy					4	6	against	afraid
sickness	✓					2	ill	✓
sleep*				✓		2½	sound	✓
stay at home*		✓				2½	away	✓
stealing		✓				1½	thief	✓
stories	✓					2	tales	✓
strict*		✓				3	harsh	✓
strong		✓				2	brave	✓
stubborn*					4	4½	awkward	weak
success			✓			3	powerful	effort
swearing				✓		3½	dirty	✓
teddy bear		✓				2	toy	✓
temper		✓				3½	hard	evil
tickle		✓				2½	toy	silly
top of the class		✓				1½	position	✓
thumb sucking		✓				3	baby	✓
unfair					5	4½	decentful	unfairishful
won't eat it			✓			2½	unwanted	✓
wet	✓					1	cold	✓
whisper		✓				2	quiet	✓
wicked				✓		1½	nasty	hard
subject's name 2	✓					3	name	✓

SPACE FOR NOTING SIGNIFICANT WORDS

<i>ashamed</i>	<i>lavatory</i>
<i>boys</i>	<i>mother</i>
<i>cruel</i>	<i>run away</i>
<i>dirty</i>	<i>shy</i>
<i>disobey</i>	<i>stubborn</i>
<i>guilty</i>	<i>unfair</i>
	<i>wicked</i>

1 Say 'boy' for boys and 'girl' for girls.

* Words which 50 per cent or over among average children fail to recall.

2 Say child's name here, e.g. John Smith

NOTE The times, response words and reproductions in the above list are those of a particular child (see p 255) given here as an illustration.

(5) Complete failure of reaction. "Cannot think of anything."

B. *Concerning the Nature of the Response Word*

(6) Misunderstanding stimulus word; interpreting it in an unusual sense in keeping with interests of the emotional complex.

(7) Avoidance by superficial reactions :

(a) Naming objects in room, e.g. ink, desk; or reacting with a word prepared before the stimulus arrives (easily detectable).

(b) Giving opposites, or synonyms or definitions. 'Too easy' associations. The former are partly a matter of mental set and of temperament. In the writer's observation schizothymes are particularly liable to adopt a definite set—minds craving order, obsessionals, etc., do the same. Wehrlein found that the tendency to give definitions (especially banal ones) was partly a matter of low intelligence, being very common in imbeciles.

(c) Repeating the stimulus word, or the stimulus word slightly modified, or a word given as a response a few moments before.

(d) Clang, rhyme, or punning associations or associations avoiding normal sense, e.g. slang on the one hand or foreign translations, and pompous, stilted reactions on the other.

(e) Reacts with several words instead of one word, according to the instructions; names objects in room.

(8) Unusual, far-fetched, or idiosyncratic reactions (these to be investigated later).

(9) Perseverations of an idea. When reactions to subsequent words have evidently little relation to the meaning of these words and instead are clearly perseverations of an idea evoked by the first word.

(10) Failure of Reproduction. (The subject cannot remember the word he gave the first time or gives a word quite different under the impression that it is the right one.)

Discussion on Interpretation

It is well established that some, if not all, of these signs tend to accompany associations which touch powerful emotional roots in the subject. But not all anomalous reactions are associated with complexes in the true restricted meaning of complex. Rather would it be true to say that there are three sources for reactions having these stigma: (1) a true complex or emotional conflict not consciously realised by the subject; (2) an emotional conflict fully in consciousness, but which the subject wishes to hide from the experimenter (or society generally—as in the case of a crime); (3) any idea having strong emotional value, e.g. as part of a sentiment. The delay, etc., in response may therefore be due to unconscious inhibitions, conscious caution, or the upset of cognitive activity due to the presence of emotion.

The test has been used with success by Jung and by others to detect crime—even minor 'crime' involving little emotional tension. Professor Washburn and Miss Leach,¹ for example, evaluated the above listed criteria with regard to their effectiveness for this purpose. Abnormality of time of response they found most diagnostic, and were able to detect 22 out of 26 cases of deceit by this means alone. Three of the remaining four they diagnosed correctly by time plus nature of association. A *very* long association proved invariably to be connected with the emotional memories in question. Jung picked out the long association times, not by comparing times with the average for 100 words, but by ranking times and taking all those above the middle value (median) established for that particular person. In most people he found the majority of the reactions at little more than $\frac{1}{5}$ second, but with hysterics he found all the reactions (even to the non-significant words) much longer—averaging, in fact, several seconds.

Using a stop-watch (i.e. dispensing with exact reaction time apparatus) the present writer finds, at any rate with

¹ *Amer J Psychol*, 1910

children and adolescents, that most normal reactions are recorded as $\frac{1}{2}$ second or 1 second. There is no loss of effectiveness through this less fine measurement (except in detecting those rare 'very rapid' reactions—which in any case are generally evident to ordinary observation alone), for the great majority of significant reactions are more than 3 seconds (hence the division of columns at this point in the above record card). Jung's technique may be decidedly improved by allowing for the fact that some words are emotionally toned for all people. The list of 100 words here used contains a great number of emotionally significant words, so that short reactions will be almost the exception. Moreover, the writer's results suggest that children and adolescents are normally distinctly slower in reactions than adults,¹ possibly because their inhibitions have been more recently acquired. The average times on each word for a group of varied mildly neurotic or difficult children and adolescents have been included in the record card above, so that each new subject's times may be put against a standard for comparison. The realisation that even in general there is a long reaction time to such words as ashamed, afraid, lavatory, etc., should save the analyst from many a wild-goose chase.

Undoubtedly long reaction time and failure of reproduction (1 and 10 above) are the most important indications of emotional conflict and of resistance. Avoidance by superficial reaction (7) is only adopted by certain types, and in any case, the use of opposites and synonyms (7*b*) occurs with practically everyone in response to many stimuli having no emotional significance.

When the significant words have been selected (usually about a dozen) they can be used as the basis for free association at a later sitting, when the reasons for particular responses can be unravelled and the main motives revealed.

In addition to the analyses of complexes by the above approach, the experiment offers evidence as to general

¹ This is found in most association experiments.

psychological type. Thus there is the type of person who indulges in adjectives of value, usually exaggerated, describing the subject's personal attitudes, e.g. *to piano*—'horrible'; *father*—'something good, nice, holy'; or, more personal and less affected, *money*—'convenient.' This mentality Jung calls the 'value predicate type,' and it is found chiefly in persons with emotional affectation, over-enthusiasm, etc., hiding an inner lack of true feeling. Furst found the personal predicate type particularly common in women over 40 and men over 60. In addition to the various predicate types, we may also distinguish: (1) the objective type, with undisturbed reactions: this is the normal, balanced personality; (2) the pedantic definition type, found principally among those of low intelligence (or who wish to hide intelligence), e.g. *apple*—'a fruit tree'; *father*—'chief of the family'; (3) the type with marked complexes, for the qualitative analysis of which the test was mainly devised.

The full possibilities of the experiment in this direction of type analysis have not yet been worked out. The significance of synonyms, opposites, definitions, etc., as an indication of obsessional types, of long reaction times at all points, together with many-worded responses, as indication of hysterical types, is repeatedly evident in the writer's experience. The test has been used by Rosanoff¹ to distinguish various psychotic conditions, and by Claude and Robin with etherised dementia præcox patients as an aid to prognosis. The results in the latter case were promising, but not of striking value.

The ease with which the child is able to assume the 'free association' attitude, i.e. to act without some definite mental set, is also of value in diagnosing personality. Poverty of ideas, as shown in constant employment of a relatively meagre set of response words, should also be noted (particularly as evidence of amount of Fluency of Association or of general emotional resistance).

Furst found a marked resemblance in reaction pattern

¹ A J Rosanoff, *Manual of Psychiatry*, 1927.

(particularly in the nature of associations) between members of the same family. For mother and child it is greater than for father and child; for parent and child of the same sex than for those of opposite sex.

Finally, one should bear in mind that intelligent subjects of good psychological insight are better able (though never completely able) to disguise complexes. Chronic patients (long-established complexes) also tend to show less obviously the typical signs in this experiment.

Example.—Girl of 13·7. Referred for stealing, lying, and bad language at home. I.Q. 90. Fluency of Association, 3rd Decile. Perseveration, 8th Decile, before treatment; 3rd Decile after. Reactions on word association test given in sample record sheet on p. 250. Significant words: ashamed, boys, cruel, dirty, disobey, guilty, lavatory, mother, run away, shy, stubborn, unfair, wicked.

Social worker's report shows child's mother (who had spoilt her) died when she was 5. Since 10 years has been brought up by father and stepmother. Father strict but emotional, and much more attached to stepmother than to daughter.

Free associations, etc., on above significant words, and the responses to them (dishonest, deceitful, hard, unfaithful, etc.) revealed: (1) (ashamed, boys, guilty)—she had lately been seeking affection with boys, and indulging in premature sex play; (2) (lavatory, dirty) an outbreak of faecal incontinence and enuresis lasting a year, not reported by parents; (3) (disobey, stubborn, unfair, unfaithful) a profound resentment at father preferring stepmother to herself; (4) (cruel, wicked, guilty) the persistence of considerable love for the father (with some fantasies about their relation) alongside hatred (ambivalence). This expressed itself in a masochistic form, inviting cruelty from the father and welcoming a sense of guilt and wickedness. Many anal-erotic elements. Treatment, through direct psycho-therapy with child, together with removal to a stable foster parent (on Children's Court order as 'beyond control' at home).

Group Test

The Pressey X-O Test, for students and for children, can be used, in one of its aspects, as a guide to emotional abnormalities, worries, and affective associations (see p. 205). It takes rather less than 30 minutes with children. Obtainable from Messrs. Stoelting.

Davis Personal Problems Test.—More direct in its approach. Requires 20 minutes or less (see p. 205). Messrs. Stoelting.

(ii) *Free Association, Play Observation, and Other Psycho-analytic Techniques*

It is somewhat difficult to describe fully the technique of 'free association' without entering into therapeutic notions in psycho-analysis which lie outside the scope of this book and which have not been subjected to the same degree of examination by scientific method as have the other notions to which we have given space.

To whatever school of psycho-therapy one may belong, however, it is impossible for one to deny the value of free association (and its homologue 'play observation' in the child) in getting at deeper emotional trends, particularly in the unconscious. Usually the subject is allowed to lie on a comfortable settee or bed in a darkened room, in circumstances which induce a half-asleep, dream-like, or hypnotic state. He is instructed to relax completely, to offer no obstacle to whatever enters his mind, to forget the usual inhibitions and embarrassments, and to describe the ideas and images that float into his mind, without regard to the need for logical connections. The psycho-therapist, out of sight, records these ideas, making particular note of long pauses, complete blanks, and other signs of resistance. It is about these points that the psychotherapist sets the train of association working on later occasions. The subject's attitude in free association is one obtained by most people with difficulty, so that practice is necessary before the procedure is carried out satisfactorily.

Opinions differ as to how far this technique is possible

with children. It is certainly possible with secondary school children of 12 years or more, but, if only because of the artificiality of the procedure when demanded of younger children, it seems advisable to make some modification for them. A useful modification consists in having a darkened box with a hole at one end through which the child peers. He is instructed to imagine things happening within and to report what he sees ("Like seeing things in clouds or in the fire"). Griffiths,¹ in her excellently controlled study of imagination, reports that the fantasies reported under such circumstances have a close connection with the child's actual dreams.

Yet to ask most children of less than 9 years, "What are you thinking about?" or even "What can you see?" (in imagination) is to draw a blank. It is then that one must turn to the observation of play. A range of toys suitable for children of all ages should be exposed to view in the clinic play-room. Teddy bears, dolls of varying mien, constructional toys, steam engines, fire engines, skittles, games of skill may well be included. In the first place, some knowledge of the emotional age of the child is gained from observing his or her preferences. Secondly, one looks for the phantasies which the child works out, often with the aid of monologue, with the toys. The present writer has found most useful in this respect (and also most popular) a variety of figures in lead, soldiers, farmer, farmer's wife, children, animals, redskins, etc., together with houses and fences which may be variously arranged in a large sand tray. Equally important are opportunities to draw and scribble, to build in bricks, and to make patterns in counters. Featureless objects like bricks are especially valuable in being more completely amenable to whatever symbolisation the child wants to give them.

Perhaps the fullest study of the significance of play (though restricted to the psycho-analytic sexual conceptions of motivation) is that made by Klein,² who says, "The

¹ Griffiths, *Imagination in Early Childhood* (Kegan Paul).

² M. Klein, "Personification in the Play of Children," *Internat. J. of Psycho-Analysis*, x, 1929, *The Psycho-analysis of Children*, 1932 (Hogarth Press).

child expresses its phantasies, its wishes, and its actual experiences in a symbolic way through play and games. In doing so it makes use of the same archaic and phylogenetic mode of expression, the same language, as it were, that we are familiar with in dreams; and we can only fully understand this language if we approach it in the way Freud has taught us to approach the language of dreams. Symbolism is only a part of it. The psychologist may well observe some of this play, and most of the games behaviour with other children, from behind a one-way screen, but if he is to make a fuller analysis of play he will need to be by the child's side, to listen to the child's spontaneous comments, to interject questions as certain things are being done or drawn, and, more rarely, to create test situations in play. There is a great deal of deeper probing to be done in play, on the lines of Klein's work, but without necessarily the same pre-conceptions. Even without this, however, it is possible, through play observation, to get a shrewd notion of the main trends of instinct for which the child is seeking expression.

(C) PHYSIOLOGICAL APPROACHES AND METHODS

A valuable ancillary to the above methods of studying emotional tendencies is provided by the techniques that have been developed for recording emotional reactions to particular stimuli through observations of certain accompanying physiological indicators of emotion, etc. Indeed, these are the only methods yet available for measuring quantitatively an emotional response, and we must not forget that a true science of sentiment and complex structure will only be possible when quantitative calculations can be made.

The principal apparatuses and methods available are:

- (1) Sphygmograph for recording frequency and amplitude of pulse.
- (2) Plethysmograph for studying the changes in volume of blood vessels and arteries.
- (3) Sphygmomanometer for recording blood-pressure.

(4) Electro-cardiograph for recording magnitude of the heart's contraction.

(5) Pneumograph for studying the breathing curve.

(6) Psychogalvanic reflex for recording electrical changes in the skin.

(7) Measures of metabolic rate changes through recording oxygen consumption.

The mental changes associated with records on (1), (2), (3), (5), and (6) have up to the present been most studied, so that fairly compact sets of apparatus and a convenient technique for using two or three of these at once have been worked out.¹ Much is gained by recording several changes side by side in this way, but when a choice must be made of one only (because of time, space, or cost), then the psychogalvanometer, which is the most promising, is best used. Consequently, that alone will be described in any detail here.

Brief Account of Indications to be gained and Methods to be used with various Apparatuses

(1), (2), (4). The effects of emotional responses on heart-beat and blood-pressure are well known. Darrow² has made the curious observation that disturbing external stimuli lower blood-pressure, whereas disturbing ideational stimuli increase it. Since the former generally give a larger psychogalvanic response than the latter, the combination of the records of these two instruments shows pretty clearly whether an emotion is due to an ideational or a presented stimulus.

(3) The plethysmograph, recording the swelling and contraction of the forearm, is somewhat cumbersome, but by means of a tambour connected to an air residue above the liquid, it can be made accurately self-recording. It has the disadvantage of a big time lag (several seconds) between the emotion and the effect; of absence of response to all but the coarser qualities of emotion, and of being

¹ Caster, *J. General Psychol.*, iv, 1930, Darrow, *J. Exp. Psychol.*, xii, 1929, Messerle, "Puls, Elektrokardiogramm, Atmung und Galvanogramm bei Schiess," versuchen. *Z. f. d. ges. Neur. u. Psychiat.*, cviii, 1937

² *Op. cit.*

affected by factors other than emotion, e.g. physical exertion, direction of attention to limb, heart peculiarities. Nevertheless, striking results are sometimes obtained.¹

(5) Pneumographic records, from a tambour attached to bands encircling the body at the thorax and below the diaphragm, are very easily recorded. Although plateaux in the curve, indicating an involuntary arrest of breathing, are of value for detecting moments of attention and effort, and although the speed and depth of breathing correlate with emotional response, the main diagnostic interest lies in the ratio of length of inspiration to expiration in individual waves.

Time of inhalation

The ratio $\frac{\text{Time of inhalation}}{\text{Time of exhalation and subsequent pause}}$ is usually about $\frac{1}{4}$, but may rise to almost 1 in conditions of emotional stress. This fact has been applied with about 80-90 per cent. success to detecting lying in persons not seasoned liars.

(6) Metabolic rate is very little increased by cognitive activity, but with the same cognitive activity under external stress (e.g. noise) or when accompanied by the slightest emotional under-current or worry, the rate increases markedly. This is a promising instrument for further investigation, though at present insufficiently sensitive, since the oxygen consumption of the body, even during resting conditions, is hundreds of times greater than that of the nervous system itself.

(7) *The Pyschogalvanometer*.—The reaction here described (also called the galvanic skin reflex) has been the subject of at least 150 published investigations, the main findings of which are implicit in the following instructions.

Two distinct phenomena are involved:

(1) The T-phenomenon, which is an actual E.M.F. produced in the body by certain mental changes.

(2) The F-phenomenon, which is a change in the electrical resistance of the body, almost entirely in the skin, associated with certain mental experiences.

¹ See, e.g., H. Eng, *The Emotional Life of the Child* (Oxford Univ. Press).

The latter is a much larger effect, and has been almost exclusively used for the purposes of measurement.

The Apparatus (for the F-phenomenon) may be one of two kinds:

(1) The ordinary Wheatstone bridge circuit with resistances approximately as shown below, which has to be balanced before the experiment, and which shows changes of the subject's resistance by movements of the delicate galvanometer.

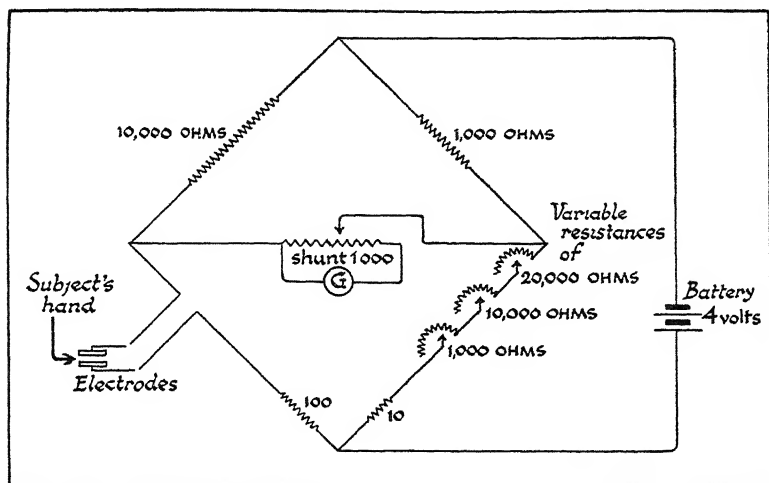


FIG 62 —Diagram of psychogalvanometer circuit

(2) The tachogram circuit, in which a current is continuously passing through the subject. Slow continuous changes of resistance are not recorded, but only the sharp sudden deflections. This has the advantage that constant vigilance in 'balancing' by the experimenter is not required, but the disadvantage that (a) deflections have to be calculated from the *area* beneath the deflection curve, and (b) the slow changes of resistance, not recorded, are nevertheless often of psychological importance.

We shall, therefore, proceed as if the first-named apparatus were being employed.

Three practical difficulties arise: (1) the necessity for avoiding polarisation effects at the electrodes attached to the subject; (2) the need to avoid changes of resistance due to muscular movements at the attached point; (3) the problem of working out the changes of resistance from the observed galvanometer deflections.

(1) and (2) are largely avoided by using flat brass or copper-electrodes of about 1 inch diameter, covered by chamois leather soaked in physiological salt solution and strapped firmly to the palm and back of the hand respectively, the arm being fixed to the chair. The same pad should always be attached to the same face of the hand (the resistance being different in different directions). Liquid non-polarisable electrodes, consisting of small cylinders into which the fingers are placed, have also proved successful.¹

From this calibration of the apparatus one can construct curves which enable one to read off the fall of resistance in ohms, for any given size of deflection (in cms.) at any particular absolute resistance of the subjects. This value (in ohms), to be made comparable with others, must next be expressed as a percentage (fall) of the absolute resistance of the subject. Even falls expressed as a percentage, however, are found not to be strictly comparable. It has been found that, on an average, the size of deflection (as a percentage fall) decreases slightly with increasing absolute resistance, at the rate of 5 per cent. (of itself) for every 10,000 ohms increase in the total resistance of the subject.² Therefore, before making psychological comparisons, every deflection at a resistance above some agreed value (say 10,000 ohms) should be increased to the size which it would have at 10,000 ohms—the standard—by the 5 per cent. correction mentioned above.

(3) is most easily overcome by substituting a P.O. Box or some other controllable resistance for the subject and

¹ See Lauer, "A New Type of Electrode for the Galvanic Skin Reflex," *J. Exp. Psychol.*, xi, 1928

² R. B. Cattell, "Experiments on the Psychical Correlate of the Psycho-galvanic Reflex," *Brit. J. Psychol.*, 1929

working out empirically the relation of various arranged falls of resistance (at various absolute resistances) to observed deflection.

Deflections also diminish with repeated stimulation,¹ the tenth stimulus (each being fresh to the subject) producing on an average only about half the deflection of the first; here too a correction must be applied.

The galvanometer (moving coil with mirror) deflections can be read off directly on the graduated light screen, but this generally necessitates an assistant being present. A satisfactory alternative arrangement consists in recording the deflections on a moving strip of photographic paper on which a time marking and the movement and duration of the stimulus are also recorded. Further information is then often obtainable from studying the developed tracings at leisure.

Procedure.—The subject's left hand should be washed free of dust or grease and strapped lightly but firmly between the electrodes. The resistance falls rapidly for the first 5 minutes, after which it reaches a stable level.² The bridge is then balanced, bringing the spot light of the galvanometer back to zero, and the presentation of stimuli may begin. These may be isolated words, as when the psycho-galvanic apparatus is used with the word association method (p 246). The deflection resulting from each is noted. The magnitude of this deflection is a more reliable³ 'complex indicator' than the length of reaction time, etc., used in Jung's method, but both together provide highly valid indications.

The psycho-galvanic apparatus has also been used in dream analysis, the points at which marked deflections occur while the subject is relating his dream being noted.⁴ It has been employed to determine reaction to particular

¹ R. B. Cattell, "Experiments on the Psychical Correlate of the Psycho-galvanic Reflex," *Brit J Psychol*, 1929

² "The Significance of the Actual Resistances in Psycho-galvanic Experiments," *Brit J Psychol*, xix, 1928

³ Whately Smith, *The Measurement of Emotion*.

⁴ Ikin, Pear, and Thouless, "The Psycho-galvanic Phenomenon in Dream Analysis," *Brit J Psychol*, xv, 1924

objects; to differentiate among the insane¹; to measure the strength of instincts and sentiments (with success), and to distinguish various types of personality²—on the basis of each person's average size of deflection to a standard series of stimuli. A recent bibliography, with references to other bibliographies, has been given by the present writer.³

Interpretation of Measurements.—The actual (absolute) resistance of the subject, which may vary from about 5,000 to 200,000 ohms, is commonly about 15,000, and itself has significance as indicating the degree of 'awakeness' of the subject. It rises as a subject settles into a state of boredom or fatigue, and becomes very high in sleep. It is low in a state of excitement, worry, or after a shock.

There is also evidence that this resistance is low in epileptics, nervous temperaments, and those suffering from Basedowism. It is high in hysterics and in the early stages of spinal paralysis. Among normal characters, resistance may be regarded as roughly proportional to the amount of suppression continuously exercised upon himself by the subject.

As regards the actual deflections, these may arise from coughing, sneezing, and laughter, but such deflections are readily distinguishable from the true deflections resulting from psychical causes.

The magnitude of deflection was once thought to be proportional to the amount of emotion, but there is considerable evidence that it corresponds rather to conation and the conative element in emotion. (Greatest deflections occur with Pain, Tension, Fear, Excitement, Will Acts, Impulses and Effort.⁴) Deflections are proportional to the intensity of the experience,⁴ whether it be pure conation or emotional toned conation.

Their magnitude is decreased by fatigue, depression,

¹ Ikin, Pear, and Thouless, "The Psycho-galvanic Phenomenon in Dream Analysis," *Brit J Psychol*, vol xv, 1924

² See M Washburn in R B Cattell's summary, *op. cit*

³ R B Cattell, *op cit*

⁴ R. B Cattell, *op cit*

alcohol, morphine, chloroform, ether, and during menstruation. The hypothesis which seems to the present writer most apt to the facts, is that the deflection is proportional to the act of suppression which the ego finds it necessary to exercise upon the impulse aroused. The psychogalvanometer can therefore be used as a measure of the strength of impulses, of will acts, and of the conflict between them.

It has a secondary value in discriminating between various types of personality, according to the size of mean deflection on a representative collection of stimuli.

Large deflections are found in cheerful as opposed to depressed temperaments, in subjects of lively and emotional disposition; those who rank high for quickness of decision, soundness of bodily constitution, and desire to excel; those who do well in examinations with only normal intelligence, and those with surgent temperament (p. 149). The correlation with the latter is $\cdot 31 \pm \cdot 08$, but it may be higher with some of the other qualities.

Unduly small deflections are found with most psychotics, but particularly with manic depressives in the depressive phase, and dementia præcox cases, especially in the hebephrenic and katatonic forms. Idiots and dements give very small deflections. Among normals small deflections are indicative of depressed temperament low emotionality, desurgent temperaments,¹ and a 'run-down' condition.

Physiological Measurements and Individual Differences of Mentality.—Attempts have been made to relate most of the above physiological measurements to temperament estimates. One of the most thorough of these ² shows that the physiological measurements of basal metabolism, blood-pressure (both systolic and diastolic) and pulse-rate have a low positive inter-correlation. A high metabolic rate was associated (to a significant degree) with 'lively'

¹ R. B. Cattell, "Temperament Tests, II," *op cit*

² Omwake, Dexter, and Lewis, "The Inter-relations of Certain Physiological Measurements and Aspects of Personality," *Character and Personality*, III, 1, 1934

as opposed to 'calm' temperaments, with high scholastic performance, and possibly with high intelligence (correlation $.24 \pm .076$). The only other finding sufficiently significant to be of any practical use was the association of low pulse-rate with self-sufficiency, dominance, and degree of effective participation in student activities.

CHAPTER VII

NOTES ON THE SELECTION OF TESTS, INTERPRETATION OF RESULTS, AND SYNTHESIS OF EVIDENCE

1. Grounds for Selection of Tests

SUCCESSFUL diagnosis, estimation or selection, depends partly on skilful and accurate testing, but even more upon a wise choice of tests having regard to the particular physical or sensory defects, education, and temperamental make-up suspected in the individual to be tested. Age, sex, state of hearing or eyesight, acquaintance with the English language, previous experience of particular tests or of manipulative material similar to performance tests, type of school attended, attitude to teacher, nervous or nonchalant approach to testing, voluntary or compulsory attendance for testing, amount of time available, degree of accuracy required, liability of the subject to fatigue. These are some of the factors which the psychologist needs to consider in the swift preliminary survey on which he is to base his decision as to the selection of test material and the mode of approach.

Always the psychologist should get some conception of the subject's educational background and a rough estimate of his mental age. The order of presentation of tests is also important. Generally speaking, it is best to start with performance tests, which evoke zest, and help to dissolve any feeling of strain or strangeness felt by the subject. Also one should start with easy tests, or at least tests which do not permit the subject to realise how far he is failing. In certain cases, notably when it is inadvisable to let the subject feel that he is being singled out for anything more than an ordinary school examination, it is best to start with attainment tests. In occupational selection, before passing

to more purely psychological tests, it is best to present tests obviously bearing on the work to be done, in order to set the tone and purpose of the sitting and call upon the requisite drives.

The technique of calling into play powerful motives has already been discussed in regard to intelligence testing, but it is equally important in every test. Except for special diplomatic reasons, the subject to be tested should be given a full explanation of the purpose of the testing and every effort made to enlist his entire goodwill. (See next section on the general interview.)

Devotees of the Binet test, whilst admitting its deficiency in 'g,' will sometimes argue that it is yet superior to the tests here advocated, in which the subject works for several minutes at a stretch on his own, because of the close 'rapport' between tester and tested. But this 'rapport' is in many cases nothing more than the rather tense atmosphere in which the experimenter is insistently firing questions at a fundamentally unwilling subject. From our knowledge of unconscious mechanisms, we must know that we deceive ourselves if we imagine that we are going to get a sound measure even of intelligence under such conditions. The time spent in getting true 'rapport' is well invested, not merely because it permits one to use what tests one chooses, but because it is in any case essential to the whole of the further course of treatment.

Nevertheless, there are some tests, notably performance tests, attainment tests, and physiological tests (psychogalvanometer, pneumograph, etc.) which can be given satisfactorily before the subject has reached any very confidential footing with the psychologist, whilst there are others, principally probes of temperament, attitude, character, and 'free association' which should be given when possible as late as the second or third sitting.

Most psychologists tend to get into a groove in testing, and thus fail to make use of the full resources of test material now available. This restriction is partly on grounds of expense and partly on grounds of portability of apparatus.

Largely, however, it is because each psychologist, in clinic, workshop, or school, finds himself dealing in the main with a narrowly circumscribed type of case.

Provided the psychologist is prepared to draw upon fuller resources when the unusual case comes along, there is no disadvantage—indeed, there are many advantages—in settling down to a particular battery of tests. He gets quick and skilful in the use of those tests, and gains valuable experience in interpretation through constant comparisons. Thus, for all normal ‘educational disability’ (i.e. backward or dull) cases in junior and infant schools, the present writer uses invariably the Seguin Form Board, the Dartington Scale O Intelligence Test, and the Midland Attainment Tests (Reading Comprehension and Arithmetic Knowledge only). The performance tests act as an introduction, as a check on the intelligence tests, and as a sidelight on temperament and character. The whole procedure takes less than an hour, and, since half the tests in Scale O can if necessary be given as a group test to four or five children immediately under the psychologist’s eye, it is possible, when occasion demands, to test half a dozen children in a morning.

Always the testing programme should be flexible enough to be altered in response to findings appearing in the opening stages of testing. Unexpectedly limited speech vocabulary (as in a case which might prove to be aphasic) may indicate the desirability of calling in a second or third performance test and shifting the emphasis in diagnosis upon them. Oddities in the approach to performance tests may suggest the desirability of adding a test of temperament or perseveration and of making a fuller home study. In a vocational selection undertaking, a change in the calibre of applicants, as, for instance, a rise in the general level of intelligence so that the scores crowd the upper reaches of the test, may necessitate a different type of test or a new manner of combining scores which will give less weight to intelligence (since it is now less a critical issue) and more to the special abilities concerned in the occupation.

Of all factors, that of time is most tyrannical to the psychologist, for the layman, accustomed to the relatively short time required for physical examinations, is prone to begrudge the longer allowance which is absolutely necessary for a reliable psychological testing. Fortunately, the subject's time and the psychologist's time are not always the same thing, for, as is shown by the example below, it is possible for the psychologist, by arranging group testing wherever it is reliable, and by choosing tests which the subject can work with a minimum of supervision, to free himself for a good proportion of the time actually required for examining the subject. And except in certain vocational guidance and employee selection schemes, it is the psychologist's time that is the prime consideration.

Time can most easily be saved by eliminating from the routine test battery those tests which make big demands in administration and scoring. An intelligence test, to be reliable, must be fairly long, but it should be scorable by a stencil key with a ready-reckoner for the I.Q. s. Probably most time is thrown away on excessive use of performance tests, excessive, that is, relative to their real contribution to one's knowledge of the individual. With a few exceptions they measure no known special aptitude, and are rightly used only as a check on an intelligence test or to replace an intelligence test in the exceptional instances of a deaf or a foreign child. Many of them, e.g. Koh's block and the Dearborn Form Board, are as intricate and time-consuming in their method of scoring as they are in administration.

Finally, though there is yet no means of shortening the treatment procedures of the psychological (psychotherapeutic, psychiatric, psychoanalytic) interview by rendering the therapeutic influences more potent, the initial diagnostic approach could be much facilitated, both with children and adults, by the right use of the objective temperament tests and character probes described in Chapter VI.

The above recommendations, as well as the detailed testing instructions in the preceding chapters, can best be given point by brief illustration through a few actual cases,

mostly from the writer's own practice, showing how the psychologist meets various situations.

Case 1.—A girl, aged 12·5, referred as being backward in school and dull, possibly feeble-minded. Since her mental age is probably between 6 and 10 years, she will be most accurately tested by the Dartington Individual Scale (p. 11). This was preceded by the Seguin-Goddard Form Board (p. 29), which is sufficiently 'g' saturated over these lower mental ages, and followed by Burt's Attainment Tests in English (Reading Vocabulary) and Arithmetic, since she was educated in London schools for which these tests were standardised.

Total time for testing, 1 hour 15 minutes, which is as much as can usually be afforded for straightforward diagnostic cases of this kind.

Result: I.Q. 81. Performance, Mental Age 9, i.e. in agreement with intelligence test result. English attainment, 10 years, which is quite up to her mental age. Arithmetic attainment, 7 years. Put in a 'C' class and coached as an Arithmetic disability.

Case 2.—A deaf boy, aged 8·6, not having learnt to speak and suspected of possible feeble-mindedness. Test of hearing shows sensory defect absolute. A testing of intelligence through performance tests, sufficiently long to leave no doubt about mental capacity, is here indicated. Given complete Drever-Collins Scale of Performance Tests (p. 36).

Result: Exactly normal. Sent to Special School for Deaf and Dumb Children, with report to treat as of normal intelligence.

Case 3.—A child, aged 3 years, tested after stay in hospital resulting from a fracture. One hospital sister considered the child 'deficient' on account of behaviour. Parents stated, on the other hand, that he was far above average.

Observed behaviour in play-room. Questioned and experimented with child, thereby making assessment on Gesell's norms of (1) Adaptation, (2) Motor and Language Development, (3) Personal-Social Behaviour.

On following morning—child now feeling at home in clinic—gave Merrill Palmer Scale. Results: above average on all three of Gesell's norms. Merrill Palmer Scale Mental Age 46 months, giving a percentile rank of 95, agreeing with Gesell's norms for adaptation. Child exceptionally independent and self-reliant for his age on norms of personal-social behaviour, this accounting for his unusual response to adult approaches by adults accustomed to children usually somewhat below average.

Case 4.—Three hundred elementary school children, aged 11, candidates for secondary school scholarships, representing the topmost 60 per cent. (according to English and Arithmetic attainment) of the original entrants. Final selection now to be on basis of intelligence.

Such an important decision in the children's careers should not be based on an intelligence test lasting less than an hour. Enquiries among inspectors reveal that the Otis Test and the N.I.I.P. Test 34 have previously been used in some schools, whilst Cattell Scale IIA has been given to some children individually. The test must cover the 11–14 mental age range, since the point of greatest required discrimination will fall at about $12\frac{1}{2}$ years (Scholarship I.Q.s in areas with the normal percentage of free places, rarely fall below 125) (see p. 27).

Tested with the Moray House Test on the first Scholarship examination; the Simplex test on the second, and the Cattell Scale II Form B (which is much more rarely used than the A form) on the third. Such a continual changing of tests is obviously necessary to avoid temptation and opportunity for coaching.

Case 5.—A scheme of vocational guidance for elementary school leavers in a Midland industrial city. Required not to take more than three hours from the child's school life and to place a minimum of 'rating for character traits' duty on the teachers.

Intelligence is the basic measurement to be made. With older children it might be measured by Cattell Scale IIIA, since occupational norms have already been obtained by

this test (p. 26). But both this and the N.I.I.P. Group Test 33 have a vocabulary too wide for the less intelligent of the elementary 14-year-olds. Cattell Scale IIA was actually given, Spearman's Measure of Intelligence (p. 15) being given when the former test had already been recently used in a school.

Attainment by the Midland Attainment Tests, four sections of English and two of Arithmetic (method and skill) separately recorded (since different callings demand proficiency in different branches of arithmetic). Other school subjects recorded on five-point classification, in each school independently.

Main occupations are factory work, engineering, clerical, and shop work. Special aptitude tests, therefore, chosen as follows: (*a*) Mechanical Aptitude—Cox's Test, which will provide a varied test in 40 minutes and select well among the more able 14-year-olds (p. 61). (*b*) N.I.I.P. Spatial Relations Test, given to all girls and some boys, with an eye to dressmaking, cutting, and similar skills in the boot trade. (*c*) Manual Dexterity, entering into many factory skills (particularly packing and sorting), tested by the Eye Board Test (p. 57), which appears to be practically the only satisfactory test of so short duration. (*d*) Meier-Seashore and Cattell-Reynolds Art Tests to a small percentage of boys and girls already considered likely candidates for further art training. (*e*) A test of 'clerical aptitude' is not given, for reasons explained elsewhere (p. 53). Instead, suitability for office work is judged from attainment tests of English and Arithmetic, I.Q., and the outcome of the temperament and character tests now to be described. To this an assessment of handwriting on the five-point scale (p. 110) is added.

Temperament and character are assessed partly by ratings (which, however, are apt to be inaccurate and require too much time from the teacher) and partly by actual tests. Ratings on the first three qualities in (*a*) Surgency (p. 149) and (*b*) Will-character (p. 193), together with certain traits—Initiative and Imagination—not covered by

these two factors. Test of temperament by Fluency of Association (also valuable in itself as a check on rating of 'Imagination'). A Perseveration Test battery, used as a group test except for one item (p. 216), gives a rough measure which is a further indication of temperament and an independent measure of stability of character, 'w.'

This testing programme, except for the special tests given to restricted groups of children, and neglecting the Attainment Tests which are given in lieu of the ordinary examination, takes slightly more than three hours. These are naturally not taken consecutively. If a further half-hour is available, the examination can be made still more thorough and complete by adding the Interests Test (p. 121), which offers valuable help in deciding whether the individual is most at home in dealing with people, with material things, or with abstractions.

Results arranged in a profile on cards giving also particulars of home circumstances and physical characteristics.

Case 6.—A public school boy, aged 15. So backward in school that the headmaster advises his leaving. His father, however, is very keen for him to obtain a university degree before being taken into the family business.

Proves to have been much absent with illness, but health now recovered. Attainment Test necessary, partly to decide which intelligence test to use. As youth is dependable and can be trusted to put forth his best efforts on his own, he is given Northumberland Attainment Tests (pp. 85 and 103), which permit psychologist to attend to other work and show less time on the case. Particular backwardness in English is revealed, which suggests that performance-test evidence must be made fairly ample. Given Passalong (p. 35) and Ferguson Form Board (p. 35). 16 + on the former and 18 on the latter.

A non-verbal intelligence test would be preferable, but the Sleight Tests (p. 12) only range up to 10 years and the Cattell Scale I up to 11 years, though both will, if necessary, give useful measures up to 15 or 16 years. In this instance, since a university career is contemplated, the measurement

must be thorough. Cattell Scale IIA is partly non-verbal, and has been combed free of unusual words. He was given this and Burt's Northumberland Test, since in both he could work on his own, with stimulation at intervals. I.Q. given respectively as 128 and 125. Advised to stay at school and to receive special coaching, especially in English. Perseveration Test (p. 216) shows moderately low 'p,' and this in agreement with general opinion that he is of very steady, serious character. Hence advised might confidently be expected by steady plodding to get a low university degree.

Case 7.—Vocational selection of workers for a large business: (1) Packers and sorters (only one-third of applicants needed); (2) clerical workers. Testing not to take more than half an hour of applicant's time.

(1) *Packers and Sorters.*—Selected partly on intelligence and partly on dexterity. As educational attainment of applicants seemed very low, a non-verbal test was indicated. Mental age also probably low, so three sub-tests from Sleight's non-verbal test were used. Upper two-thirds according to this test then given Eye-board Test (p. 57) and Leake-Smith Form Board, which appears to involve sorting skill (p. 31). Other qualities by very brief standard interview (p. 289).

(2) *Clerical Workers.*—Selected by (i) intelligence test; (ii) perseveration to indicate reliability, drive, and attention to detail (moderately low 'p' wanted); (iii) test of English and Arithmetic attainment. Intelligence on abridged form of Scale IIIA (two sub-tests only—suitable for adults rather above average) (p. 15). Perseveration by adult battery (p. 212). This cannot be abridged, because norms would be invalidated and reliability dangerously reduced. The whole half-hour is taken up by these tests, so attainment test must be brief. Midland test of English Comprehension, Spelling, and Arithmetic Knowledge, each started not at beginning but at 12-year level. Elimination first by I.Q. (it was possible to reject below 105), then by attainment (elimination of those impossibly low in one or both

subjects), and finally by perseveration (last because least dependable of tests).

Case 8.—Social research scheme. Comparison of students in a university who have matriculated : (1) from schools segregating sexes; (2) from co-educational schools; with regard to (a) frequency of neurotic tendencies; (b) general knowledge; (c) attitude to social questions, particularly regarding position of women; (d) general character development; (e) temperament.

Self-ratings to be made on Psychoneurotic Questionnaires: (a) each syndrome separately, and (b) with results pooled (p. 227). General Knowledge by test (p. 107), and by Ballard's test of Geography, History, Algebra, Academic Knowledge, and other attainment tests (p. 75), and by Watson's test of General Knowledge, Thurstone Attitudes tests (p. 146), selected items. Character by rating scale (p. 193), filled in by committee of fellow students, and by perseveration test (p. 216). Degree of Surgency (extraversion) by rating scale (p. 150).

Case 9.—University woman student, aged 20, complaining of nervous symptoms of an obsessional type, though actually the physical illnesses which she also describes indicate an hysterical pattern. Disabling tremor of right hand, liability to over-excitement, vague illnesses, and threatened 'appendicitis' which medical man considers to have no physical foundation. Some anxiety about university examinations; both parents and lecturers doubt whether she ought to continue at university.

Two intelligence tests, with an interval between, were given, since it was necessary to have an accurate measure on which to base advice as to degree. In such circumstances, it is generally as well to have tests by different designers, to diminish overlap of special factors. N.I.I.P. Test 33 and Cattell Scale IIIA. I.Q. 114.

Perseveration test needed to indicate general nature of character structure (p. 216) and spot-dotting test to check indications of obsessional make-up (p. 223). Second decile on former and very high score on latter test,

indicating hysterical constitution type and obsessional make-up.

General history brings out other obsessional traits and their possible origin. Detailed psychotherapeutic examination begun with Jung's Association Test (p. 246) in conjunction with the P.G.R., followed by free association (in later sittings) on five key issues discovered in the sitting. Two of these lead up to origin of hand tremor. The free association procedure is shortened, and put on a surer foundation, through a single examination with these objective aids. On grounds of I.Q., advised vocationally to give up university course. This, together with essential psychotherapy, caused symptoms to clear up in four months.

Case 10.—A 'problem' child. Secondary school boy, aged 13, referred by school and parents for repeated disregard of authority, taking money from other boys and from strangers by false pretences, causing trouble by fabricating stories, etc. School work described as very poor relative to his apparent intelligence.

Physical examination reveals no defect except digestive weakness. Hyperthyroid in appearance with slightly protuberant eyes.

Whilst history and home enquiry are being followed up by social worker, he is tested as follows. Since he shows signs of not settling down well at first, the investigation is begun with a number of performance tests. Enjoys Koh's Block, M.A. 12.0 (p. 43) and Knox Cube, M.A. 13.0 (p. 32). Shows some lack of planning capacity in Passalong, M.A. 12.6. As he is still markedly distractable, is given as intelligence test Spearman's 'Measure of Intelligence' (p. 15) as an individual test. I.Q. 112. (Given Cattell Scale II some weeks later, attained I.Q. 114.)

On second visit and prior to discussing difficulties with psychologist, is given Perseveration test (p. 216). Result: extreme score, decile 10, indicating deep, long-standing, emotional frustration, and conflict. As he is said to have 'no stable interests,' is given Interests test (p. 121), which shows high interest in mechanical matters, in parents and

home, and in social life, low on sport, artistic, naturalistic, and religious interests. It is significantly higher than average (2 deciles) on the whole, i.e. wide general knowledge relative to his I.Q.

A temperamental test of fluency (p. 152) gave a middle value, decile 5, i.e. not substantiating his apparently highly surgent temperament, which may therefore be temporary.

On third visit he is given Jung's Word Association Test. Significant words are 'disobey,' 'dreaming,' 'helpless,' 'jealous,' 'run away,' 'stay-at-home,' 'stubborn,' 'stories.' The following-up of these words led to an evaluation of his emotional problems. These are too complex a subject to be discussed in the space here available, but, simply stated, the main roots turned out to be a rejection by the mother from the time of his birth and a jealousy of a delicate (favoured) younger brother. His intelligence was such that direct therapy was possible, beginning with his being given insight into his own problem. At the same time the social worker discovered factors in the mother's history accounting for the rejection and for certain maladjustments between the parents. Thereby it was possible to improve these matters, and so to bring about some real alteration in the relations to and management of the child. On the school side a demonstration of the boy's actual I.Q. resulted in the staff modifying their belief that he was slacking. His incipient interests in science were fostered, and a revival of attention began which spread to other school subjects. His character improved immediately on the adjustment of the home situation. For three months there were sporadic recurrences of the old trouble, but after six months his case was closed as adjusted, and there has been no recurrence.

2. Interpretation and Synthesis of Results

The significance of the measurements from any single test is fully discussed in the sections which deal with that test. Before reading the present chapter, therefore, the experimenter should make a thorough study of those

sections, as indeed he probably will have done already in the process of choosing tests suitable for the particular purposes he has in mind. In the case of tests still in the experimental stage, e.g. perseveration tests, fluency tests, the psychogalvanic reflex, this reading should extend to the literature given in the references, if any extensive use and interpretation of the test is to be attempted.

Here we can only discuss the interpretation of the more common interrelations of test results. First let us face the not unusual situation of finding a performance test mental age significantly above or below that obtained by the intelligence test. In such circumstances, if only one performance test has been given, it is well to give another. If these agree in being higher than the intelligence test, one should first ask whether the latter has been properly chosen having regard to the educational attainment of the child. Or has the child had practice in something very similar¹ to the performance test? These simple possibilities being ruled out, one must look to special aptitudes (rarely) or to temperament-character effects.

It is difficult to generalise about performance tests, since they have so little in common, but it is the experience of most psychologists that a high score relative to intelligence test mental age is frequently achieved by children of good, persistent, determined character. Conversely, where the performance test mental age is below the I.Q. indication, one may suspect that the child or adult is not making good use of his intelligence—is perhaps temperamentally not capable of making good use of it.

Qualitative differences in handling performance tests are also well worth recording, for it is generally true that the foresight, perseverance, or emotional instability shown in the test situation are equally characteristic of the individual's behaviour in more important or social situations. But not invariably: one must take into account the part which that momentary test situation plays in the

¹ The cumulative indication of research on transference of training is to the effect that the practice must be *very* similar to produce any effect.

individual's purposeful life plan. Some adults, for example, will come with a play attitude or a suspicious or a lazy and half-hearted approach, so that their behaviour is no indication of what they would do with anything touching a major sentiment. Marked persistence in a performance test situation may also arise from a strong self-assertive instinct, and be no indication of continuous persistence in the large affairs of life, such as arises from a well-integrated self-regarding sentiment. Some tests, notably Mazes, the Passalong, Koh's Block, seem to be better done by boys than by girls, and evidently involve some temperamental factor of initiative and emotional stability, but other tests involving manipulative skill, e.g. the Seguin, show no such difference. Bearing such points in mind one should watch for differences in performance test scores.

With regard to attainment tests, it is necessary to point out that discrepancies between the subdivisions of the same test, as between speed of reading, spelling, and grammatical habit are by no means uncommon, and often throw interesting light on the past education, on reading habits, and on the atmosphere of the home (good speech, much or little reading). Differences between arithmetic attainment age in "mechanical skill" and in "method knowledge" are equally prevalent and equally instructive. A child of 13 or 14 years in a special (dull) class, having a mental age of, say, 8 years, will generally have a 'method' age of about 8 also, but in 'skill' may be at 13 or 14 yrs. or even higher. Such a child, interested in his work and well-instructed, may make very great progress in the speed and accuracy of the simple processes, but it is very rare to find him ahead in 'knowledge.'

In general, attainment in arithmetic follows closely the mental age, and is very rarely above it, but attainment in English, at least in reading and vocabulary, can be pushed well above the mental age, and the writer has known more than one instance of a Mongolian imbecile, with a mental age of 4 or 5, getting a reading attainment age of 9 or 10.

The relations of I.Q., A.Q. (p. 78), and E.R. (p. 78), are well worth studying in the interests of attaining a sound picture of the individual's adjustment, his sentiments, and on that of energy, etc.

It is the experience of all psychological clinics that low attainment (relative to mental age) is frequently associated with emotional difficulties or instability. Observations suggest that this is particularly true of specific, chronic disability in arithmetic, which is often associated with an hysterical kind of emotional instability; but there is no true research evidence on the matter. Some backwardness in arithmetic, on the other hand, is due merely to school absence, often occurring in early school life, which has caused the child to miss some particular step on which all later advance depends. Backwardness then engenders dislike for the subject, and dislike backwardness. Always one should distinguish backwardness through absence or accidental causes from backwardness through systematic chronic disability. The latter is much more likely to be linked with emotional causes: attitude to the first teacher, retraction of libido from social activities. (Hence general English disability may be associated with a desurgent temperament.) The writer has seen some cases of spelling disability, in which the deficient attention to peculiarities of word form was just part of a general absence of function of the 'reality principle' in the individual's dealing with the external world. Attention to the emotional confusions, obstinacies, or regressions of the subject should then precede or accompany whatever coaching and analysis of intellectual difficulties take place in remedial work on special disabilities.

The implications of the intelligence test itself, i.e. mental age (more properly "intelligence age") are perhaps already sufficiently clear from the earlier discussions on 'g' and 's.' One may perhaps point out, however, that the power measured is not always conterminous with the popular conceptions of intelligence. One of the most popular notions of intelligence involves also an activity,

an ingenuity, a creativeness which is not part of 'g,' and which is probably measured to some extent by 'fluency of association.' In most instances, where the person fails to live up to the predicted level of intelligence, some factor of this kind—low surgency or high perseveration—is working to cause the 'g' to be merely latent or spasmodically employed, though it will always be revealed again in a test situation or anything requiring passive comprehension of complexities.

On the other hand, 'g' is operative in fields where 'intelligence' in the popular sense is not usually thought to be important, notably in all kinds of actual sense perception, judgment of shape and distance, of relative pitch, etc. It should also not be overlooked in measuring special aptitudes. Most measures of special aptitudes already contain some amount of 'g,' so that there is no need to take the person's intelligence into account in addition to the test result when predicting his performance in particular fields. Where special aptitude tests do not, however, correlate with 'g'—as in the case of some manual dexterities—it is best, in predicting the success in any job, to take 'g' into account too. Whether this should be done additively or by multiplication is not yet entirely clear either theoretically or practically, so that the person engaged in vocational selection will need to combine the scores in some way suggested by his knowledge of the particular job. Usually the special aptitude can well be given much greater weight, at any rate in all sorts of routine work.

The effect of interest upon the expression of intelligence should never be left out of account. For example, effective use of intelligence in social situations—so-called 'Social Intelligence'—is probably largely a function of social interest (as measurable by the interests test) and surgency of temperament, both of which conduce to the acquisition of social experience, plus good intelligence.

To predict the suitability of a person for inclusion in a given educational or vocational group, certain persistent selective effects in the group concerned should always be

taken into account, over and above the I.Q. itself. Even before these are considered one needs, of course, to have an accurate idea of the average I.Q. and the scatter of I.Q. which normally exist in the class, school, or vocational group concerned. The diagram on p. 26 should be useful in this respect. Among the selective effects one must consider age—e.g. the lower I.Q.s in a class are usually among the oldest boys, whose mental age therefore is often as high as or higher than that of the 'brightest' boys. The highest I.Q.s will not therefore necessarily come out at the top of the class. The longer that group is kept together, however, the more will the high I.Q.s come to the top, since their mental age is increasing more rapidly. Classification according to I.Q. in the first place avoids this spreading of the field which is so upsetting to effective class teaching.

Among the vocations, as the writer has argued elsewhere,¹ the general effectiveness of members of a given calling probably does not vary as much as the I.Q. Those with I.Q.s in the lowest quartile seem to have compensatory gifts in character, temperament, or special aptitude, whilst those who apparently have exceptionally high intelligence for the job are lacking in these. This must be taken into account when deciding, from a comparison of I.Q. with a given occupation level, the fitness of the person for that occupation.

Occasionally this selection produces even an inverted relation of I.Q. to effectiveness. Thus, among students who have passed with equal success the various examinations necessary to reach a degree, those with lower I.Q.s necessarily have had to have temperament-character advantages absent among the brighter but only equally successful. If one attempts to select, say, good practical teachers from such a group by means of intelligence tests, one finds the correlation of 'g' with teaching success very low or even negative; for those temperament-character qualities which have become inversely related (in this particular group) to intelligence are actually

¹ "Occupational Norms of Intelligence," *Brit J Psychol*, 1934.

more important in teaching than in the examination, and now determine the order of teaching success.

One special occasion for intelligence test interpretation which perhaps needs comment here is that which involves advising the secondary school leaver as to his fitness for taking a degree, or as to the type of degree and the subject in which he may best take it. The average I.Q. and I.Q. scatter of successful (London) degree students is given on p. 27 (which also gives figures for Cambridge students). Columbia University results show that I.Q. has a fairly close relation to class of degree obtained, so that one may to some extent foresee, from a comparison of the given I.Q. with the above scatter, whether a first or third class is likely. The surveys of Dale¹ and White² show that certain academic subjects require a higher I.Q. than others. The order of 'g' saturation for various subjects obtained in these surveys is in general agreement with that obtained by mathematical analysis of the amount of 'g' in such subjects at school level, but is different in a few particulars, because the subject is not necessarily the same in matter and form at the university level as at the school level. Dale found the following order of decreasing intelligence demand: Mathematics, Classics, Natural Sciences, English, Modern Languages, History; while White, classifying according to Faculties, found the decreasing order Arts, Science, Medicine, Laws, Librarianship, Engineering, Journalism, Architecture, Fine Arts. At the school-leaving level the intelligence test is a valuable help in prognosis and in avoiding misplacement, but in the more highly selected groups of second- or third-year students, already at the university, emotional maladjustment seems rather more important in determining failure and success.²

These notes on the interpretation of intelligence test results would not be complete without reference to those

¹ Barbara Dale, "The Use of Mental Tests with University Women Students," *Brit J Educ Psychol*, February 1935

² H D J White, "An Application of Mental Tests to University Women Students," *op cit*, November 1931

instances, happily rare in good tests, when considerable disagreement exists between the verdict of the component sub-tests. It used to be said that high variability in the Binet test, i.e. absence of a sharp failing point, with resulting scatter of pass and fail items over several years, was indicative of emotional instability in the subject tested. It was never proved, however, that the connection was at all a close one, neither was the theoretical basis clear. Presumably it indicated at least an abnormal educational background and possibly high 'oscillation' of attention and capacity.

Big differences between sub-tests should always be investigated further; the subject may have failed, through some slip on the part of the examiner, to get a fair grasp of the instruction. Some valuable sidelights on the subject's temperament may be gained by comparison of the tests particularly well done and particularly badly done. Certain sub-tests, though they correlate in general well with intelligence, admit of being upset completely on rare occasions by the lack of some special (but very normal) aptitude. Thus, in one instance a child who scored 8 out of 12 on Line's test in the Dartington Scale and who, therefore, definitely could not be lacking in intelligence, scored only 3 on the Substitution (Symbol digit) test. On further examination this proved to be due to inability to handle a pencil (a rare degree of muscular inco-ordination) which had caused the child to spend undue time and effort merely in making the circles and crosses. True oscillation effects, as shown by scatter of fail and pass items in a graded sub-test, in which most subjects proceed so far and then fail, are certainly frequently found in emotionally unstable subjects. It sometimes appears strikingly in performance tests. Occasionally the normal rapid decline of test-time on the three successive trials of the Seguin Form Board may be replaced by a rise and fall. With young children (below 6) this is not so uncommon, but among older children it often accompanies defective powers of concentration and nervous instability. From

Spearman's original work, as yet inadequately followed up, it seemed likely that this oscillation of performance would be particularly high among epileptics. Certainly three of the highest oscillations on the Seguin-Goddard test recorded by the present writer were by epileptics, one of whom had a slight attack of 'petit mal' in the middle of the test, so that the cause of the unusually long time score was definitely observable. With young children and invalids, marked differences on sub-test scores often arise from fatigue, and indicate nothing more than that the experimenter has failed to notice premonitory signs of it and adjust his testing programme accordingly.

At the present time, owing to the chaotic state of research in the temperament-character field, it is the temperament tests and character probes that offer the greatest difficulties in interpretation; indeed, a really fruitful use of these tests is only possible to the psychologist who has through experience obtained an artist's skill in applying them, and who is fully versed in the relevant research literature.

Thus, for example, the reasons for discrepancy between 'fluency of association', as tested, and 'surgency' of temperament, as observed, are still matters for research, yet the total picture in cases of high fluency and low surgency sometimes indubitably points to maladjustment crippling a natural surgency. In one instance a secondary school boy, referred for obstructiveness and offences against authority, proved to have a fluency score in the ninth decile, yet was described as being dour and unsociable. This boy also had an I.Q. of 139, so that his school difficulties were not at all due to intellectual factors, whilst his perseveration score was moderately low, suggesting no systematic character defect. His father proved to be a man sadistically attached to this boy (for reasons too complex to describe here), and took a pleasure in shackling him with all sorts of exacting restrictions. The boy's reaction to this authority was being carried over to all authority. Whilst treatment was going on, the headmaster was persuaded to give the boy opportunities for social expression and leader-

ship in spite of his apparent lack of the necessary qualities. Within a surprisingly short time he became a thoroughly surgent type and a leader, exhibiting, to the great surprise of the school, the qualities which the tests indicated as being present, but which had hitherto been conspicuously absent.

Just because no single temperament, interest, or character test can as yet be wholly depended upon, it is necessary to glean temperament indications from as many and varied tests as possible, whilst making them brief. A youth of 18, hitherto of entirely good repute in school and out of it, was referred for behaviour superficially very much like a manic-depressive psychosis. He would have prolonged periods of excitability, would stay out all night, and would react violently if attempts were made to control him. At other times he was silent and depressed, refusing to get out of bed. He was said to be quite a social figure, but an interest test pointed to a distinct lack of social and human interests. Tested with a perseveration test he was at the eighth decile on the first occasion and beyond the tenth on the second. These findings indicate a schizophrenic rather than a manic-depressive disorder. The experimental criteria of Kretschmer (p.167) also agreed with this and the patient's build was emphatically of a leptosomatic type. Thus, in spite of his accessibility at that time, his periods of complete normality, and his atypical behaviour when considered as schizophrenic, he was considered to be in all probability an incipient dementia præcox case, who should be recommended to go as a voluntary patient to the mental hospital. This diagnosis was in time confirmed at the mental hospital.

In spite of many instances where the perseveration test result neatly dovetails into the rest of the picture which one is constructing, this test remains least certain of any in its indications. Thus, although most very low perseverators have the unduly quick excitability, the tendency to nag, and the active instability of mood noted on p. 209, some are among the most model characters. It is quite possible that there are two types of low perseverators: (1) those with too

great mental energy—the unruly type mentioned above, and (2) those who are as defective in mental energy as many high perseverators, but who force themselves to live up to an exacting standard of will function (in psycho-analytic terms a hyperactive super-ego). These are very critical with themselves and with others, put great emphasis on the will, and are often silent and anxious in bearing. It is possible that these are the persons who constitute cases of fluctuation between the extremes of perseveration, creeping up to the tenseness of extreme low perseveration and then snapping and falling to the extreme of high perseveration with melancholic or schizophrenic accompaniments. These are speculations based on close observation of only one or two cases; yet in the interpretation of temperament tests at the present time such clinical impressions must be borne in mind as possible guides. After some experience, one does in fact get a very definite understanding of the personality which these tests indicate, even if it is not possible always to make the conception fully explicit in our present verbal terms. A low perseverator is, in spite of brusque reactions and arbitrary behaviour, a fundamentally likeable person who will respond to personal loyalties and do his best to be dependable. A high perseverator is usually a much more difficult person to get hold of and never entirely calculable. High fluency with high perseveration gives at once an impression of extreme rascality, just as high fluency with moderately low perseveration brings out the attractive qualities which make for natural leadership.

The use and interpretation of temperament interest and character tests should also assist in following the course of treatment. The tests of 'w' used by Hartshorne and May with large groups have been used successfully with individuals and smaller groups in tracing the changes in honesty and reliability resulting from various applied influences. The further discussion of the significance of these tests in individual and group situations is, however, in the present stage of their evolution, beyond the scope of a book of this size.

3. The Complete Case Study

Sometimes the bare test results are alone a sufficient basis to enable the psychologist to decide upon a change in a child's school classification, the selection of an employee, or the necessity for treatment, but in other instances the test is only a part of a comprehensive interview or series of interviews in which the interpretation of the tests is determined by the whole picture.

There are two principal types of interview, the planning of which requires discussion here: the psychiatric interview and the employment interview (which in a sense cover the vocational interview and the psychological or social research interviews). Much has been written about the second of these,¹ and it is only the first which needs to be set out in any detail.

Of all interviews, however, one can say that:

(1) They should follow a definite scheme in the mind of the interviewer (or be a standard interview on paper), since only in that way are fair comparisons of individuals to be made; and

(2) The interview plan should be flexible, especially in the psychiatric interview, permitting the subject to display his lines of interest. It is the interviewer's ultimate aim to appeal to the subject's hidden fears, prejudices, and ambitions, in order to bring them into the open. Nevertheless, the interviewer needs to keep control, if only to avoid dawdling in irrelevant places. He should lead up to what he wants to talk about and interject a direct question when the facts he wants are finally not forthcoming.

(3) The subject should be given time to get accustomed to his surroundings. For this reason it is often best, as indeed it is frequently on other grounds necessary, to let the routine part of testing precede the interview. With neurotic adults or difficult children it is particularly neces-

¹ Principally H W Bingham, "The Three Functions of the Interview in Employment," *Management Review*, xv, 1926, *How to Interview* (New York) J J Crawford, "The Art of Interviewing," *Industrial Management*, lxi, 1921 P M Symonds, *Diagnosing Personality and Conduct* Woodworth, "Psychological Experience with the Interview," *J Person Res*, 1925

sary that the surroundings should be æsthetically pleasant and not contain stimuli which normally condition a defensive or emotionally-disturbed state. Notably, one must avoid a too formal, police-court-like setting. Thus children who are unhappy at school will be far more responsive in a room that is most unlike a classroom—preferably a room with toys and a certain amount of untidiness. Always the room should be such as to give complete privacy.

(4) It is best to begin with pleasant topics which are, however, of real interest to the subject. With children these are usually play interests; with adults they vary greatly according to class, etc. A social worker interviewing working-class mothers may even find that the subject's health or rather her illness and physical complaints form the most attractive opening subject.

With children referred for problem behaviour, as also with adults who are not familiar with the objects of a psychological clinic, it is best to remove strangeness by saying a few words about how the clinic tries to help, what it is for, and why the person has been sent. To leave a question-mark standing in the mind of the patient too long is to give opportunities for an obstructive attitude to grow up around it. It is illuminating to find out what the child or parent has heard about the clinic, or the employee about the selection methods, and to correct caricatures. In all interviews the interviewer and the interviewed must have some common goal and purpose, if the conversation is to proceed rapidly and fruitfully, and though this direction may be of the most general kind, to wit, the improvement of the patient's condition, it must be jointly envisaged.

(5) The interviewer should show as early as possible that he is able at once to verify the truth of statements, or that he is prepared to do so. For that purpose he should be entirely sure of his own facts relevant to the case before the interview, and should verify fresh facts between interviews. Valuable evidence on home conditions is often obtainable by interviewing parents and children independently and

before they have had time to influence each other, and by comparing purely factual statements. Generally, the findings of the first interview will suggest definite facts for the social worker to enquire about before the second interview.

(6) With delinquents the facts of the delinquency should be taken for granted. The child should not be given confirmation in his expectation that he is to be morally re-proved once more and that demonstrations of repentance are required. But he may be given to understand later that his motives for the action are of interest; that a problem remains unsolved, and that he must be helped to realise what dissatisfactions are behind the actions which led up to his delinquency. In all this, a detached but kindly interest, without censure, superior amusement, or condonation is proper to the stages of investigation, though the psychologist may enter more feelingly into the situation at the later stage of therapy when transference and suggestion are employed.

(7) Although theoretically self-evident, it is necessary in practice to warn against implying answers to one's own questions, i.e. against leading questions, particularly among children, of whom 99 per cent. will say what they think is expected or wanted. Likewise, the interviewer must guard against premature interpretations forming in his mind during the first interview, before all aspects are known. Rice,¹ in his experimental study of the methods of a number of skilled interviewers interviewing (for a social enquiry) a number of 'down and outs' found that one interviewer, a prohibitionist, recorded that 62 per cent. imputed their position to drink and 7 per cent. to industrial conditions; another interviewer, a socialist, questioning the self-same group, found 22 per cent. attributing their position to drink and 39 per cent. to industrial conditions. Each was a trained and conscientious investigator. Psychiatric interviews, unless improved, can match this in variation of interpretation of case-histories.

(8) Various devices must be cultivated with the taciturn,

¹ "A Contagious Bias in the Interview," *Amer J Soc*, xxxv, 1929

suspicious, or diffident person. Normally, questions should be framed briefly and clearly. They should suit the vocabulary of the person interviewed, so that they mean what one intends them to mean, and, since children have little power of interpretation in general terms, questions of a generalised nature are usually wasted. But in these circumstances they need occasionally to be provocatively ambiguous, to call forth discussion. Or, failing to get a response, the interviewer may suggest alternative answers, making sure that both will be unacceptable to the subject. Usually, too, the person interviewed should be encouraged to qualify his answers, not merely to answer yes or no. The influences of primitive passive sympathy should not be neglected. Some volubility on the part of the interviewer is the best stimulant to talkativeness in the person interviewed, though it must necessarily be controlled at the right moments. For similar reasons the interviewer should be genuinely at his ease, frank and friendly, encouraging by nod, gesture, and smile. (Naturally this applies more to the psychiatric than the business interview.) Again, the interviewer needs to be a good listener with an expectant (but not too inquisitive) air and an occasional offer of inviting or insistent silences. With children, if any depth of acquaintanceship is desired, the adult must quickly indicate that he is not to be classed with the typical 'adult-in-authority.' He must, moreover, remove the child's inferiority barrier by penetrating into fields where the child knows more than he does himself, so that the child is able to accept him on a basis of give and take. It is valuable even to abdicate from the physically superior position of sitting in a big chair behind an impressive desk and to join the child in floor games or in an informal chat sitting on the table. He must show that he is 'with the child' and possessed of common enjoyments and concerns. For this reason he may well parallel experiences recited by the child with similar experiences recounted from his own childhood. There is little danger of this fraternisation being overdone; indeed, much work with children fails through the psycho-

logist being unable, in the time at his disposal, to separate himself emphatically enough from the parent or teacher image with which the child is in difficulty.

Further discussion of the technique of 'rapport' in the psychiatric type of interview would take us into questions of 'transference,' for the adequate treatment of which the psychologist must be referred to his text-books on psychoanalysis. Most maladjusted individuals, whether children or adults, readily acquire such a transference or emotional dependence upon the psychologist if the latter is really rendering assistance in emotional problems. It is a thing passively to be encouraged in the early stages, because it renders easier the bursting of emotional barriers and causes the subject to be much more fundamentally responsive to the psychologist's suggestions. Nevertheless, its growth must always be carefully watched, since the psychotherapist's aim must eventually be to make this dependence unnecessary. Its eventual dissolution may unintentionally be rendered unduly difficult. This is admittedly a greater danger with adults than with children, who are in any case normally psychologically dependent on parents during childhood, but even with the latter it is necessary for the psychologist who deals with large numbers of children to shift the transference from himself to other personalities able to act as wise mother or father substitutes. The supply of such willing and capable persons is an important concern of any child psychologist dealing with an extensive list of cases.

(9) For certain purposes it may be valuable to include tests within the interview, without the person interviewed being subjected to any formal testing. Great as is the demand for such techniques, the difficulties of devising anything which can at the same time satisfy the psychologist's demands for reliability is even greater, and only one or two tentative and none-too-reliable essays have yet been produced (see pp. 3 and 16). These are Snedden's "Measuring General Intelligence by Interview" (*Psychol. Clinic*, xix, 1930), a vocabulary test with a validity

reaching 0.8, and Lester and Hewlett's "Measuring Introversion and Extraversion," by rating the amount of overt reaction (mainly talking) when twelve provocative statements (some virtually questions) are made.

(10) The results of the interview need to be adequately recorded and dated. In a business interview this may be done during the proceedings, but when matters very intimate to the individual are being discussed in the psychotherapeutic interview, the right atmosphere is all too readily destroyed by the sight of such taking down of evidence and, with children originally referred for delinquency, it may excite suspicion and distrust. Then the record should be written or, better, dictated, immediately after the sitting, and should preserve mainly the actual responses, the psychologist's conclusions or impressions being clearly separated. Alternatively, and particularly with adults, the psychologist may remain screened from the reclining patient, whose free associations he may take down verbatim unobtrusively. Children's play in the clinic play-room is similarly best observed from behind a one-way screen.

There are standard forms for most employee selection interviews, and some good standard approaches have been similarly developed for psychiatric interviews¹ (see e.g. Tjaden's *Analytical Interview* (p. 195), or any text-book of psychiatry, e.g. Stoddart's *Mind and its Disorders* (p. 533)).

With the latter, however, such rigidity should not extend farther than the first 'case taking,' for it is in the free pursuit of patients' conversational trends that the study eventually lies.

The following scheme has been found a useful one in interviewing (for the first time) nervous, difficult, and delinquent children. It is intended to act both as a guide to procedure and a framework for recording.

¹ For more detailed schemes see H W Bingham, *How to Interview*, S I Franz, *Handbook of Mental Examination Methods* (Macmillan, 1920), and G H Kirby, *Guides for History-taking and Clinical Examination of Psychiatric Cases*, 1921

Scheme for Initial Interviewing of Delinquent or Nervous Children

Opening remarks on why child has come to the psychologist.

Ask child first why he thinks he has come, in case he has been brought on some fraudulent misunderstanding which requires correction. Explain aim to help child; he is one of a great many. Doubtless good reasons for what he has done. Anything he tells one will be entirely in confidence. Necessity for frankness. (The psychologist will need to be on his guard against inadvertently betraying information about parents or teachers given by the child through confusing it with the social worker's reports which may need to be discussed with parents, teachers, or in a police court.) Notice general bearing of child (especially fidgeting, nail-biting, degree of fatigue, steadiness of attention, etc.).

Questions on play life, or observations of child's play with toys with which he has been supplied, or talk with him about jokes in a comic paper he may be reading. Social or individual games preferred? Active or passive? Older or younger boys or girls? Leader? Reading preferences. Love of animals.

Questions on companions. Which he admires? Why? Especial chums? Are they good scrappers? Have they a gang? Do they outwit their parents? Fond of books or games? Indulge in swearing or bad habits? (Get initial slant on child's own nature from his comments on friends and the nature of his friends.) Has he many friends? Do people tease him? Do his parents like his friends and let him bring them home? How often can he go out?

Questions on illnesses and absence from school. Head-aches or sickness? Fainting or dizziness? Eating and sleeping habits (if necessary to discuss masturbation, best done among physical habit questions).

School life. Liking for school? Does he do well or badly? (cf. teacher's account). What teachers he likes or dislikes and why. School societies or teams. Subjects liked or disliked.

Attitude towards family. What do parents think of

school work? Of delinquencies or nervousness concerned? What punishments, and are they deserved? Father or mother better liked? Get an idea of actual amount of time spent by either parent with child. Peculiarities of parents or hints of criticism of parents. Favouritism, and if so, of which child? Rules and restrictions and how much enforced?

Fears and emotional conflicts. Nightmares. Ordinary dreams and of what. (Detailed in subsequent interview.) Day-dreams. Sleep walking or talking. Nervousness of standing before class. Other fears. Bullying by other children. Shame in regard to sex matters or to physical inferiorities. Tics. Enuresis. Thumb-sucking or nail-biting. Early emotional memories. Left-handed. Stuttering. Accidents or operations. First day at school. Death of relatives. Degree of conscientiousness in details. Liking for lonely activities, cycle rides, etc.

Delinquencies or minor misconduct. What have people said? What is subject's attitude? What was the real beginning of the difficulty? Early lying, stealing, or revolt. Were these treated rightly? Is subject likely to feel the same again? Has he ever had similar impulses which he has succeeded in restraining?

Plans for the future. Vocational interests. Results of tests. Would subject like to come again to talk about things?

Except in unusual circumstances the interview on these lines is preceded by whatever testing of intelligence, attainment, and temperament is deemed necessary, but the more complex probing of character through word association tests, miniature situations, free association tests, play situations, etc., described in Chapter VI (especially Section 4*b* (ii)) dovetails naturally into the later stages of the interview. Indeed, until the psychologist has begun the preliminary interview survey, he cannot know which of these probes he will need.

The above scheme may take from one to four interviews. It is always necessary to keep in mind, how-

ever, that the course of events should be adapted in response to the perceived needs of the situation, since treatment is bound to begin, to some extent, even in the first interview. With the fuller course of treatment as such, however, this book is not concerned.

APPENDIX

NOTES ON MATHEMATICAL FORMULÆ

THIS appendix is meant to provide practically all those formulæ needed in routine work and many of those required in research in psychology. Its purpose is mainly to act as a source for the psychologist, and not as an introduction to statistical methods. Consequently, the notes are very scant, and only sufficient to remind the psychologist of the purpose of the formulæ. In any case, most psychologists cannot afford the time to make themselves familiar with the mathematical sources from which the formulæ are derived, and must content themselves with knowing the circumstances in which these tools can be used. For a very useful introduction to statistical methods¹ the reader is referred to Dr. Wynn Jones's *Introduction to the Theory and Practice of Psychology*. A valuable guide to mathematical methods and a very full list of formulæ is found in Holzinger's *Statistical Methods for Students in Education*. For the derivation of formulæ the reader is referred to G. Udny Yule, *An Introduction to the Theory of Statistics*. Also *Statistical Methods for Research Workers*, by Fisher, and the research articles of Pearson and Spearman (see e.g. Appendix to *The Abilities of Man*).

Statistical Terms

The Mean is the value obtained by adding up all the individual measurements and dividing by the number of measures.

The Median is the value of the middle item in a collection of measurements, or that point above which and below which are 50 per cent. of the measurements.

The mean may be upset by a few extreme scores, whilst the median isn't; but the median cannot be employed in most computations in the way that is possible with the mean.

¹ See also Chapter I of Prof H. R. Hamley's *The Testing of Intelligence* (Evans Bros Ltd).

The *Mode* is the value at which most cases occur, i.e. the most frequent measurement among all the measurements.

Expressing the Degree of Variability or Scatter of Measurements

It should be noted that the attempt to define range by quoting the extreme values is practically valueless since these vary greatly from sample to sample. We may use:

(1) *Mean Deviation* or average deviation obtained by adding the absolute values (neglecting signs) of all the deviations from the mean and dividing by the number of cases:

$$M = \frac{\sum d}{N}$$

(2) *Standard Deviation*, obtained by squaring the deviations from the mean, adding them together, taking the average, and finding its square root, i.e. :

$$\sigma = \sqrt{\frac{\sum d^2}{N}}$$

(3) *Quartile Deviation*.—The position of the lower quartile Q_1 is established by finding the value that has one-quarter of the measurements below it and three-quarters above. Similarly, the upper quartile Q_3 is the value that has only one-quarter of all the measurements falling above it. The *Quartile Deviation* or *Semi-inter-quartile range* is half the distance between these two points. It is one of the simplest measures of dispersion to work out, and conveys at once a rough notion of the amount of scatter.

$$Q = \frac{Q_3 - Q_1}{2}$$

(4) *Pearson's Coefficient of Variation*.—This expresses variability independently of the general magnitude and nature of the measurements, so that with its aid one might compare variability in size of mice with that of elephants, or the variability in weight of commercial pounds of butter with the variability in volume of pints of milk:

$$V = \frac{100 \sigma}{M},$$

where σ and M have the meanings indicated above.

Normality or Skewedness of Distribution of Measurement

Any large number of measurements may have the general nature of their distribution graphically expressed by means of a histogram. This is constructed by taking a certain interval in the measurements and erecting rectangles at this interval along a base line, each rectangle being proportionate in height to the number of cases that fall within that interval. A best fitting curve may later be fitted to this histogram. For most psychological measurements this curve follows the normal probability curve (see references above for formula and purpose of the normal

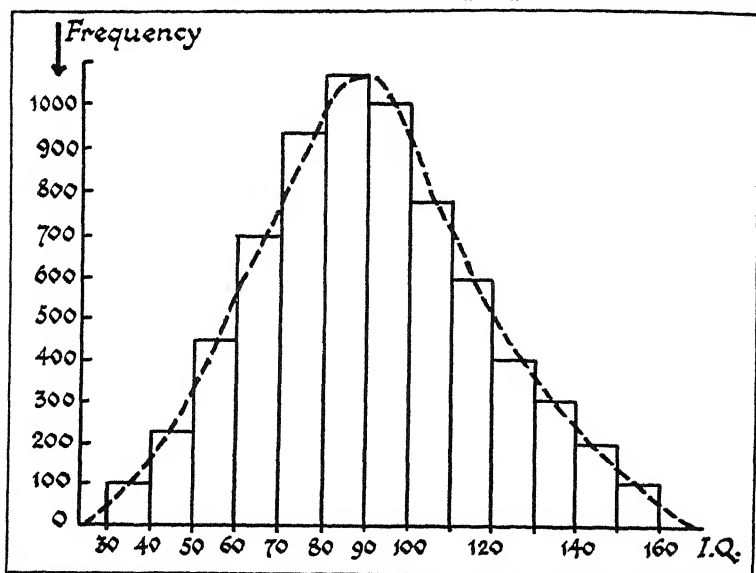


FIG 63—Distribution diagram, showing method of constructing histogram and distribution polygon or curve

probability curve). Most psychological measurements on a sufficiently large population fit into this normal symmetrical probability curve approximately,¹ but sometimes the curve is lopsided or skewed, and it is necessary to express the amount of skewedness. This can be done by means of :

¹ Actually they form a leptokurtic curve superficially resembling a normal probability curve, but the latter has mathematical properties which make its use generally convenient

Pearson's Measure of Skewedness :

$$Sk = \frac{M - Mo}{\sigma},$$

where M is the mean ; Mo is the mode;

$$\text{or } Sk = \frac{3(M - Md)}{\sigma},$$

where Md is the median.

Measures of Association of Two Sets of Measurements

Since a considerable amount of time in psychology is devoted to finding the degree of relatedness between two mental functions by comparing the lists of scores in those two functions obtained by a single group of individuals, it is only to be expected that many mathematical means of expressing this degree of relatedness should have sprung up. The most commonly used is:

The Correlation Coefficient, of which the soundest and original form is:

The Bravais-Pearson Product Moment Formula :

$$R = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}},$$

where the x 's are the deviations from the mean in the one activity and the y 's are the corresponding deviations of each person from the mean in the y activity (e.g. Jones is -5 from the mean in French and -13 from the mean on mathematics; therefore, $xy = 65$).

$\sum xy$ is the sum of the xy 's of all the people in the group and $\sum x^2$ the sum of the squares of the deviations.

To save working out the deviations, the same formula may be expressed in a way which permits the use of the scores as they stand:

$$r = \frac{\sum XY - NM_x M_y}{\sqrt{(\sum X^2 - NM_x^2)(\sum Y^2 - NM_y^2)}},$$

where N equals the numbers of cases, and where M_x is the mean of X , and M_y the mean of Y .

As Stephenson has shown, this formula, if used with measurements that have been scaled down to the same mean and standard deviation in both sets of measurements, can be simplified to:

$$r = 1 - \frac{\Sigma(X - Y)^2}{2\Sigma(X^2 - NM^2)}$$

Where all possible inter-correlations have to be worked out between a half-dozen or more performances, a considerable saving of time and trouble is generally made by investing in the little extra time at the beginning required to scale the results to the same distribution. The denominator in the above equation then becomes the same for all correlations, so that the formula becomes:

$$r = 1 - \frac{\Sigma D^2}{K},$$

where D is the difference between the individual's raw score in x and y , and K is the constant denominator obtained from the formula above.

Rank Correlation Coefficient.—The above formulæ are based on calculations with actual scores or measurements. When dealing with smaller numbers of cases, say, not more than fifty, it saves time to ignore the measurements and to work on ranks. One arranges individuals in their rank order, and carries out subsequent calculations on these ranks. With certain kinds of material the results are in any case first given in ranks, measurements not being possible. One may then use:

Spearman's Rank Formula:

$$\rho = 1 - \frac{6\Sigma d^2}{N(N^2 - 1)},$$

where d is each individual's difference in rank order between the two rankings.

Since this formula assumes equal spacings between the ranks, it needs a correction to make it strictly comparable with the product-moment coefficient as follows:

$$r = 2 \sin \frac{\pi}{6} \rho$$

The correction is so slight as to be scarcely worth making except in research work.

A still more simple rank formula is:

Spearman's Foot Rule:

$$R = 1 - \frac{6 \sum D}{N^2 - 1},$$

where D represents the positive differences of rank only. This gives very rough values, but is useful in preliminary surveys.

Correlation Ratio.—The above correlation coefficients are strictly only to be used when a linear relationship exists between the two series, i.e. when a regular increase in one produces a regular increase or decrease in the other. Two series of measurements may be closely related and yet not have these linear correlations, e.g. Perseveration and Will Character (see p. 208). The correlation coefficient will then yield a much lower figure than the true correlation deserves. With such material a proper estimate of the degree of relatedness is obtained better by the correlation ratio:

$$\eta_{xy} = \frac{\sqrt{\sum f y \bar{xy}^2}}{\sigma x}; \text{ or}$$

$$\eta_{xy} = \sqrt{1 - \frac{\sigma^2 ax}{\sigma x^2}},$$

where σax is the standard deviation of the differences from the position assumed by the regression line.

Coefficients of Association, Colligation, and Contingency

It is often desired to find the amount of association between results which are not expressed in a series of measurements or ranks, but are simply divided into one or two categories in respect to one matter and the same number of categories in respect to the other with which it is required

to find the degree of association, e.g. presence or absence of motor accidents related to drinking or teetotalism. We may then use:

Yule's Coefficient of Association :

$$Q = \frac{ad - bc}{ad + bc},$$

where

a is the number of cases in which both attributes are present;

b the number in which the first attribute is present and the second absent;

c the number in which the second is present and the first absent;

d the number in which both attributes are absent.

Another measure yielding results more numerically comparable with the correlation coefficient is:

Yule's Coefficient of Colligation

$$\omega = \frac{\sqrt{ad} - \sqrt{bc}}{\sqrt{ad} + \sqrt{bc}},$$

the symbols meaning the same as in the above.

When there are more than four or five categories on each side, a useful device is:

Pearson's Contingency Coefficient (Coefficient of Mean Square Contingency):

$$C = \frac{\sqrt{S} - 1}{S},$$

$$\text{where } S = \sum \left(\frac{f^2_{xy}}{f_x f_y} \right),$$

f_{xy} being the frequency of cases in any one box below; *f_x* the frequency of cases in the column in which that box occurs, and *f_y* the frequency of cases in the row in which that box occurs. After the cases have been distributed in the boxes, therefore, this fraction is worked out for each box and summed for all the boxes to get the value 'S.'

	<i>Low P</i>	<i>Mod Low P</i>	<i>Mod High P</i>	<i>High P</i>	<i>f_y</i>
<i>High w</i>		6	4	1	11
<i>Medium w</i>	2	1	3	4	10
<i>Low w</i>	5	1	3	9	18
<i>f_x</i>	7	8	10	14	

FIG 64 —Showing relation between scores in character ('w') and in perseverance ('p'), arranged for calculating the contingency coefficient.

Thus, for the box indicated by heavy underlining,

$$\frac{f^2_{xy}}{f_x f_y} = \frac{3^2}{10 \times 10} = .09$$

Correlation with Three Variables

When the correlations have been found between three variables (in three pairs), it is sometimes required to find the amount of correlation which would exist between two of them if the third were kept constant, e.g. the relation between school attainment and estimations of character, intelligence being kept constant. Such an estimation may be obtained by the following:

Partial Correlation Formula :

$$r_{12.3} = \frac{r_{12} - r_{13} \cdot r_{23}}{\sqrt{(1 - r_{13}^2)(1 - r_{23}^2)}}$$

$r_{12.3}$ = the correlation of 1 with 2 when 3 is kept constant.

Effects of Chance Errors in Measurements

In many measurements it is necessary to allow for effects due to chance errors of experiment, or to decide whether a given mean, difference of means, correlation coefficient, etc., is one which, as likely as not, could be obtained by

chance, or one which is definitely significant. For the latter purpose the notion of 'Probable Error' has been developed. The probable error of a measurement will depend, among other things, upon the size of the sample taken, relative to that of the total population.

The meaning of the probable error value is best illustrated by saying that if the probable error of a measurement is 4.5, there is an even chance of the measurement being within 4.5 units (above or below) the true measurement (i.e. that from the whole population). Unless a measurement is bigger than its probable error, therefore, there is only a fifty-fifty probability that it means anything at all (i.e. that it is not purely a product of chance factors).

The probability of getting a measurement, by sheer chance, twice as big as the P.E. is only .1773 (in 1), three times as big, .0430, four times, .0070, and five times, about .0007. Consequently, the general convention has been adopted that a measurement can be regarded as significant if it is at least four times its P.E. A measurement even two or three times the P.E. is, however, an indication of the need for further enquiry as to significance

(1) *Probable Error of the Mean:*

$$P.E._m = \frac{.6745\sigma}{\sqrt{N}}$$

(2) *Probable Error of the Differences between two Means, when Uncorrelated.*

$$P.E._{m1-m2} = \sqrt{(P.E._{m1})^2 + (P.E._{m2})^2}$$

(3) *Probable Error of Correlation Coefficient:*

$$P.E. = \frac{.6745(1 - r^2)}{\sqrt{N}}$$

(4) *Probable Error of Rank Correlation Coefficient:*

$$P.E. = \frac{.7063(1 - \rho)}{\sqrt{N}}$$

(5) *Probable Error of Correlation Ratio*: precisely as that for Correlation Coefficient.

(6) *Probable Error of Coefficient of Association*:

$$\sigma Q = \frac{1 - Q^2}{2} \sqrt{\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}}$$

(7) *Probable Error of Contingency Coefficient*: too complex to be given here. See Holzinger, *op. cit.*

It should be noted that the general effect of chance errors on a correlation coefficient is not to raise or lower it by a chance amount, but rather to produce a definite diminution. If the consistency coefficients for the tests concerned are known, it is possible to correct the coefficients for the attenuating effect of errors, and to discover the value which the correlation between the two abilities would have if the test for these abilities were perfectly reliable. This correction for attenuation is as follows:

$$r_{ab} = \frac{r_{a1b1}}{\sqrt{r_{a1a2} \times r_{b1b2}}}$$

where r_{a1a2} is the consistency coefficient of the A test, r_{a1b1} is the observed correlation between the two tests, and r_{ab} is the corrected coefficient (i.e. correlation between 'true' scores).

There is also a formula which would enable one to allow in the correlation coefficient for the effects of any selection which has previously taken place with the group concerned. It is well known that a reduction in scatter tends to reduce the correlation coefficient. This formula will be found in Wynn Jones, *op. cit.*

Another cause of the correlation coefficient being below its true value is an undue shortness in the test itself. An idea may be obtained of the size that the correlation coefficient would have had, had the tests been longer, by means of:

The Spearman Brown Prophecy Formula Figure for Predicting the Consistency of Lengthened Tests :

$$R = \frac{nr}{1 + (n-1)r}$$

where r is the original consistency coefficient and n is the amount by which the length of the test is multiplied. The standard error of the above formula is

$$\sigma n = \frac{n(1+r)}{r \sqrt{N}}$$

A similar formula may be used to discover what the validity of a lengthened test would be, viz. :

$$R = \frac{n(r_1)}{\sqrt{n + n(n-1)r_2}}$$

where r_1 is the original validity and r_2 is the consistency coefficient of the test.

Factor Analysis

The Tetrad Difference Equation is as follows:

$$r_{12} \cdot r_{31} - r_{13} \cdot r_{21} = 0.$$

If this equation is satisfied, we may suppose that the abilities concerned in these correlation coefficients are divisible into a general factor and factors specific to each test. Naturally, this condition, owing to experimental errors, is never exactly fulfilled, and it suffices if the tetrad differences arrange themselves approximately in a normal probability curve with a standard error not significantly greater than the standard error calculated according to formula. A very rough formula for this probable error is:

$$\text{P.E.} = \frac{1.349}{N^{\frac{1}{2}}} r (1-r),$$

where r denotes the mean of the correlation coefficients taken into account.

This tends to give values rather too small. A fuller range of suitable but much more complex formulæ will be found in the Appendix to Spearman's *Abilities of Man*, whilst a discussion of tetrad difference calculations and the theory of 'g' will be found in Appendix I of Thomas's *Ability and Knowledge* (see p. 1).

INDEX

- 'a' factor in temperament, 165
- Accomplishment quotient, 78
- Acquisitiveness disposition test, 180
- Adaptation Board, 42
- Aggressiveness by test, 225
- Alexander, W P, 36
 - performance test, 37
- Algebra attainment tests, 105
- Allport's personality questionnaire, 204
- Anxiety hysteria, 227
 - rating scale, 231
 - personal questionnaire, 237
- Anxiety neurosis, rating scale, 204
 - personal questionnaire, 237
- Anxiety neurotics in spot-dotting test, 223
- Arithmetical ability, 46
 - attainment test, knowledge of methods, 99
 - attainment test, mechanical skill, 103
 - and intelligence level, 280
- Arthur's performance tests, 41
- Artistic ability, 51
- Ascendance-submission test, Allport, 174
- Assertiveness disposition test, 178
 - physiological test, 266
- Atkins' object fitting test, 43
- Attainment tests, 75
 - technique of construction, 146
 - discrepancies in, 280
- Attitudes tests, 146
- Aveling, F, 226

- Ballard, P B, 76, 78
 - on *The New Examiner*, 75
- Bascdowoid type, 167
- Bernsteuter personal inventory, 204
- Binet, 67
- Binet-Simon scale and revisions, xiv, 7, 42, 268
- Biology attainment tests, 106
- Bleuler, 165
- Biavas-Pearson product-moment formula, 301
- Bridges' emotional development rating scale, 194
- Brotlemarkle comparison test, 204
- Burt's test in æsthetics, 52

- c' factor, 149, 151
- Cady's measure of incorrigibility, 201
- Casust form board, 38
- Cattell intelligence tests, norms for scales O, I, II, and III, 18-25
- Cattell-Reynolds test of artistic aptitude, 52
- Cautiousness disposition test, 183
- Character, 190
 - goodness of, by rating scale, 193
 - direct tests of, 195, 199
 - indirect tests of, 207
- Clerical aptitude tests, 53
- Clinic playrooms, 257
- Coefficient of association, 304
 - correlation, 301
 - by ranks, 302
 - contingency, 304
- Conceit index, 225
- Confidence test, 225
- Conversion hysteria, 227
 - rating scale, 231
 - personal questionnaire, 239
- Cornell form board, 37
- Correction for attenuation, 307
- Correlation coefficient, 301-302
- Correlation ratio, 303
- Cox, J W, 46, 56, 61
- Cube construction test, 43
- Culpin, M, 223
- Cyclothyme-Schuzothyme temperament, 148, 165
 - tests of, 167

- Davis personal problems test, 205, 256
- Dearborn form board, 37, 270
- Decroly matching game, 43
- Dementia præcox, 208, 265
- Dependence disposition test, 187
- Designs test, 43
- Deterioration in intelligence, measurement of, 16
- Dexterity, 55
- Diagonal form board, 39
- Digit-symbol test, 43
- Dispersion of scores, formulæ for, 299
- Disposition, 173
 - tests of, 174
- Distribution diagram, 300
- Downey will-temperament test, 169 170
- Drawing ability, 54
 - tests, Burt's, 54, 106
 - Goodenough, 54
 - Midland scale, 55
- Drawing attainment, 106
- Drever-Collins performance scale, 36

- Economics attainment tests, 106
- Educational ratio, 78

- Eidetic imagery, 167
 Electrical knowledge test, 106
 Electrocardiograph, 259
 Emotional age, 194
 instability, 193, 281
 Endocrine gland types, 148
 English attainment tests, composition
 and construction, 93
 grammar and style, 90
 knowledge of literature, 94
 reading, 82-86
 spelling, 89
 vocabulary, 86
 Epileptoid character, 229
 rating scale, 232
 and oscillation, 286
 Equal units method of scoring, 49

 'f' factor and tests, 157
 norms, 162
 variable relation to surgency, 286
 'Factors' and 'abilities', 48
 Feature profile test, 44
 Ferguson form board and norms, 31-32
 Fernald, 67
 ethical discrimination test, 204
 Five-figure form board, 39
 Fixation hysteria, 227
 Fluency of association, 151
 tests of, 152
 norms, 162
 and 'imagination', 282
 Flugel, J. C., 206
 Form relations test and norms, 72
 Free association, 117, 256
 French language attainments test, 106
 Freud, 227, 228, 258
 Functional fluctuation, xv, 163

 'g' factor, 1-3, 282
 saturation, 284
 Galton, F., 173
 Garnett, M., 151
 Gaw, F., 30
 General knowledge tests and norms, 107
 Geography attainment test, 108
 Geometrical aptitude, 46
 Geometry attainment test, 108
 German language attainment test, 108
 Gesell's intelligence test and norms, 8
 three-figure form board, 39
 Gillespie, R., 228
 Goddard form board, 29
 Gregariousness, disposition test, 181
 Guessing in tests, 80

 Halo effect, 193, 202
 Hamley, H. R., 11, 17
 Handwriting attainment scales, 109
 Midland norms, 110-114
 Hartshorne and May, 196, 198, 288

 Healy picture completion test and norms,
 33-34
 Healy construction puzzles A and B, 40
 Helpfulness test, 226
 Hildreth, G., xiv
 Histograms, 50, 300
 History attainment test, 109
 Hollow square form board, 43
 Hypochondria, 227
 Hysteria, 208

 Individual versus group testing, 7, 268
 Inferiority feeling, scale of, 226
 Imagination, 273
 Inquisitiveness, disposition test, 185
 Instincts, measuring strength of, 120
 Institute of Education, 17
 Institute of Medical Psychology, 151
 Intelligence, its nature, 1, 281
 Intelligence quotients, 2, 283
 in various occupations, 26
 in various types of school, 27
 Intelligence tests, classification of, 3
 construction points, 4
 administration of, 5, 268
 test material available, 8
 Integrate-disintegrate types, 166
 Interest testing, 117, 274
 test material, 121-140
 instructions and norms, 141-143
 profile, 145
 Interview, planning of, 289
 Tjaden's analytical form, 195
 employment, 289
 psychiatric or psychotherapeutic, 295
 Introversion-extraversion, 119
 tests of, 164
 Inventive answer form, 4, 79
 Italian language attainment tests, 109

 Jaensch, 165
 Jung, 165, 252

 Kent-Shakow form boards, 44
 Klein, M., 257
 Knight, R., 1
 Knox cube test and norms, 32-33
 Koh's Block, 43, 270
 Krapelin, 165, 230
 Kretschmer, 165, 170

 Latin attainment test, 109
 Leake-Smith form board, 31
 Little pink tower test, 43
 Logical ability, 46
 tests of, Bistol, 60
 Burt, 60
 Fox, 60
 Noll, 60
 Lying, detection of, 260

- Mania, 208
 Manikin test, 44
 Manual dexterity tests, 57
 Mare and foal test, 44
 Mathematical aptitude, 47
 McDougall, W., 165, 227
 Mechanical aptitude, tests and norms,
 60-62
 knowledge test, 115
 Median samples, 79
 Meier-Seashore art judgment test, 51
 Memory, 63
 ratio, 64
 tests and norms, 65-70
 Mental age, 2
 Merrill-Palmer test norms, 11
 Metabolic rate, 259
 and temperament, 265
 Midland attainment tests, 81, 273
 Moores form board, 40
 Moral knowledge tests, 197
 Murphy, G., 199
 Musical ability, 46
 aptitude tests, 63

 National Institute of Industrial Psychol-
 ogy, 47, 53, 59
 Nervous and delinquent children, inter-
 viewing of, 295
 Neurasthenia, 227
 Neurasthenic tendency, rating scale, 230
 personal questionnaire, 234
 Neurosis, nature of, 227
 Northumberland standardised tests, 85,
 86, 103, 274

 Oakley form board, 40
 Oates, 172
 Obsessional neurotic and spot-dotting
 tests, 223
 neurosis, 227
 Obsessional-compulsive tendency, rating
 scale, 232
 personal questionnaire, 242
 Occupational norms of intelligence, 26
 Oscillation of mental efficiency, 285

 Paper tests of intelligence, 4
 Paranoid constitution, 229
 rating scale, 233
 personal questionnaire, 244
 Partial correlation, formula, 305
 Passalong test, 35
 norms, 36
 Percentile ranks, 50
 Perceptual tests of intelligence, 3
 Performance tests of intelligence, 3, 17,
 267, 269, 279
 as temperament and character tests,
 28, 279
 material available, 29-44

 Perseveration and character, 207-210,
 287
 tests, technique of, 211
 battery of tests for adults with norms,
 212-216
 battery of tests for children with
 norms, 216-222
 Physiological tests and personality, 258
 Pinard, 207
 Pintner and Paterson, 29
 Play observation, 256, 295
 Plethysmographic records, 258
 Pneumographic records, 259
 Porteus, 17, 194
 character rating scale, 193
 Practical ability, 46
 Practice effects in intelligence tests, 6
 Pressey X-O test of emotional make-up,
 205, 256
 Press, foot and hand co-ordination test,
 59
 Probable error, formulæ, 306
 Projection tests, construction, 175
 material, 177
 Psychogalvanic reflex, 120, 259-265
 interpretation of deflections, 264
 Psychogalvanometer circuit, 261
 Psychological aptitude, 46
 Psychoneurotic inventories, 202
 Psychotherapeutic examination, 277
 Pyramid test, 43

 Questionnaire tests, critique of, 202
 Quickness of decision, 265

 Rapport in interviews and testing, 268,
 293
 Rating scales, construction of, 193
 of character, 193
 neurotic character, 227, 230-246
 observers, consultants, and self-inven-
 tory, 229
 Raubenheimer's character tests, 200
 Reading attainment tests, 82
 and mental age, 280
 Reliability coefficient, xv
 Religious knowledge test, 115
 Retentivity test, 65
 Rorschach's tests, 165, 168
 Rosanoff, 254
 Ruckmick's emotional expression test, 71

 's' factors, 1
 Seashore's musical talent test, 63
 Seguin form board, 29, 269, 285
 norms, 30
 Scholarship examinations, 272
 Scholastic tests, 75
 Schwartz social situation test, 69
 Science attainment tests, 115
 Scores, conversion to standard units, 48

- Scoring by median samples, 79
 Selection of tests, 267
 Selective answer form, 4
 Self-inventories, 229
 Simmins, 151
 Sleight's non-verbal test, 12, 274
 Social intelligence, 65, 282
 Social and emotional development scale, Bridges', 194
 Spanish language attainment tests, 116
 Spatial sense (visual), 71
 thinking, 47
 Spearman, C, 1, 46, 54, 64, 67
 Spearman's 'foot-rule' formula, 303
 Spearman's measure of intelligence, 15
 Spearman-Brown prophecy formula, 308
 Special aptitudes, their nature, 45
 Specific factors in abilities, 2
 Sphygmograph, 258
 Sphygmomanometer, 258
 Sports information test, 116
 Spot-dotting test, 223
 Standard deviation, 49, 299
 Stenquist mechanical ability test, 45
 Stephenson, W, 3, 35, 46, 71, 208, 219
 Studman, G, 151
 Suggestibility tests, 226
 Surgent-desurgent temperament, 149
 rating scale, 150
 tests of, 157
 Synthesis of test results, 278

 Tachogram, 261
 Temperament types, 148
 tests, 152-173, 269
 and the psychogalvanic reflex, 265
 Terman, L, 73, 202
 Tetanoid type, 166

 Tetrad difference equation, 308
 Thompson, G, 13
 Thurstone, 146
 neurotic inventory, 206
 Touch placing dexterity test, 59
 Traits, existence of, 198
 Transference in the psychotherapeutic interview, 293
 Triangle test, 39
 Trigonometry attainment test, 116
 Two-figure form board, 38

 Valentine, C W, 75
 Verbal ability, 3, 46, 72
 and temperament, 281
 Verbal factor in intelligence tests, 3
 Verbal intelligence tests, 3
 Vernon, P E, 30, 198
 Vocabulary tests, 86
 Vocational guidance, 117, 149, 174, 272
 Voelker's test of trustworthiness, 200

 'w' factor, 191, 288
 Wallin peg boards, 42
 Webb, C, 191
 Webb's problematical situations test, 67
 Wit, 73
 Wynn Jones' scale, 74
 Woodworth's psychoneurotic inventory, 207, 228
 Worcester form board, 44
 Word association test, adults', 246
 of introversion, 163
 complex indicators in, 218
 children's, 219
 interpretation of, 250
 Wynn Jones, 74, 307

